Competency-Based Training (CBT) in higher education

Towards an implementation in Ghanaian polytechnics

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Peter Boahin
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Chapter 1

Introduction

1.1 Background of the Study

The global economy is changing to the extent that knowledge has become more important than physical capital as the source of present and future wealth. This means that knowledge; skills and resourcefulness of people are increasingly becoming the major assets that determine the profitability of companies and generates wealth creation rather than ownership of land, machines and material capital (Drucker, 1993; Brown et al, 2008).

This means that it is the competition of ideas, knowledge and skills that define the new economy. Therefore, a nation's position in the world economy depends largely on the level of importance attached to higher education institutions (HEI). Research studies have shown that HEI contributes greatly to increasing relevant skills, labour productivity, entrepreneurial energy, social mobility and quality of life, encourages political participation, strengthens civil society and promotes democratic governance (World Bank, 2009). This means that, investment in higher education is essential to developing countries if they are to advance in a world economy where knowledge has become a vital area of advantage. This is further emphasized in a report by UNESCO (2010) that 'at no time in the history has it been more important to invest in higher education as a major force in building an inclusive and diverse knowledge society and to advance research, innovation and creativity'. The reason is that, the information revolution driving the emerging world economy mostly comes from people with tertiary education (World Bank, 2008a; AAU, 2011). It is for this reason that Kofi Annan (2000) stresses on university education to become a primary tool for African's development in the new century so that it can develop African expertise, analyse African problems, strengthen domestic institutions, good governance, conflict resolution and respect of human rights and enable African academics to play an active part in the global community of scholars.

Higher education institutions particularly in developing countries need to provide increasing number of students with both specialized skills because specialists are increasingly in demand in all sectors of the world economy. Furthermore, it must provide the kind of education that encourages flexibility and innovation to allow the continual renewal of economic and social structures relevant to the fast changing world (Brown et al, 2008).

In this era of creative and flexible learning, most higher education in developing countries still adopt a passive approach to learning where students' success in examination is based on their ability to reproduce a credible portion of their notes from memory. Although the curricula and teaching methods have remained largely unchanged in developing countries over the years, employers are increasingly demanding analytical thinking, communication and entrepreneurial skills (World Development Report, 2007). Both technical and core

competencies have become increasingly valuable in the rapidly changing labour market that requires employees to adapt to new development in technology and working operations (World Bank, 2008b).Against this background, it is crucial for developing nations to adopt a more innovative view of learning that emphasizes active intellectual engagement, participation and discovery, rather than passive absorption and reproduction of facts. This reform requires re-design, review and implementation of new curricula and academic programmes that would transform the teaching and learning process. Effective reform or innovation in HEI in developing countries also requires high-level support from educators, industry, government, prospective students and other relevant stakeholders. Such innovation must be customized to fit the nation's stage of development, political system, social structure, economic capacities, history and cultural system (OECD, 2004).
The pressure for change in teaching and learning in the vocational and educational training (VET) systems has become even more necessary due to reasons such as global economics, industry restructuring and policy initiatives from the government (OECD, 2000; Curtain, 2004). In this regard, the development and application of skill standards derived from the curricula of competency-based training (CBT) is one major teaching and learning approach that is believed to have a strong potential to increase skill levels, reduce unemployment rate, increase productivity and to achieve international competitiveness (Smith & Blake, 2005).

Even though socio-political factors may account for the introduction of CBT in some countries, the demand for well-educated and innovative workforce at all occupational levels has been a major reason for CBT reforms in the VET systems of many countries.
Other reason is that training activities in the most VET systems do not match with the skill needs of the industry. It is believed that countries that invest more in high-level skills tend to increase productivity; intermediate-level skills also address unemployment, while lower-levels skills reduce social inequities and vices in an economy (Keating, 2008). As a result, both governments and industry have attached importance to the VET system to provide all levels of skills as a means to reduce unemployment rate, increase productivity and achieve international competitiveness.

Countries such as the United States of America (USA), the United Kingdom (UK), Australia and The Netherlands have several decades of experience in the implementation of CBT in their VET systems. Central to the literature on CBT about these countries is the growing concern and dissatisfaction over the relevance of the content of formal educational programmes to the workplace environment. There is a commonly expressed belief that institution-based courses too often emphasize on theoretical knowledge at the expense of the ability to apply knowledge to perform required competencies in the workplace. Even though these countries have different contexts for CBT reform in terms of their socio-economic, cultural, political and industrial settings, the major reasons that necessitated for CBT reforms were theory-based curricula, recessionary economic conditions and high rate of unemployment particularly among the youth.

In the UK for instance, it is argued that courses and programmes in the VET concentrated on gaining knowledge and theory to the neglect of performance (Keep, 2000, Boreham, 2002). In Australia, CBT was viewed not only as the foundation for reform in vocational and post-compulsory education but also the means of increasing skill levels and productivity (Keating, 2008).

In the US, the vocational curriculum was usually prepared by teachers who placed more emphasis on book knowledge other than practical activities. The result was over-reliance on certification as the main criterion for hiring employees or workers (Carter, 2005). As a result, new models of delivering skills and credentials were adopted in the education and training system to prepare students adequately for a globally competitive workforce (Levesque et al, 2000).

In The Netherlands, the curricula in the vocational education was theory-based and for that matter, most of the students left school without adequate level of skill training leading to high level of structural unemployment particularly among the youth (Biemans et al, 2004, Cedefop, 2010).

In South Africa, the OutcomeBased Education (OBE), a variant of the CBT was introduced to provide skill training among the labour force in order to reduce unemployment and achieve economic development (Allais, 2003, Department of Labour, 2003). Like the challenges mentioned already, increasing rate of graduate unemployment particularly from higher education institutions in Ghana has been a major challenge facing the government and the industry community.

1.2 Higher Education in Ghana

In Ghana, higher education refers to any education and training beyond secondary education. They consist of colleges, universities and post-secondary specialized educational institutions. These include colleges of education, nursing training colleges, Agricultural training colleges, Technical training centres, Vocational and technical training colleges, Labour colleges, Polytechnics and Police and Army staff training colleges. In Ghana there are seven state-owned universities (public) and about 51 privately-owned universities most of which have been affiliated to the local and international universities. There are ten polytechnics, one in each region of the country and several national and international specialized colleges that are also affiliated to some of the local universities for the award of professional and post-graduate degrees. While theoretical education and scientific research remain in both the public and private universities, professional education is offered in the polytechnics. In 2007-2008 academic year, enrolment in the public universities and the polytechnics were 93,973 and 34,448 respectively, while over 20,000 students were also enrolled in the private universities (Newman, 2011). For the purpose of this dissertation, polytechnic education would be the focus our discussion.

The establishment of Polytechnic education in Ghana began as technical institutes that were training craftsmen and lower level technicians. The need for technical education to train middle-level skilled personnel in the 1960's led to the establishment of Accra, Kumasi, and Takoradi as technical institutes. In 1963, these three technical institutes were elevated to polytechnic status but continued to operate as non-tertiary, second cycle institutions

offering mostly advanced craft courses and technician level courses (Afeti, 2005). Similarly, Tamale and Ho technical institutes attained polytechnic status in 1984 and 1986 respectively, while Sunyani and Koforidua technical institutes also became polytechnics in 1997. Although Cape Coast polytechnic was established in 1986 as a polytechnic institution, it gained tertiary status in 1993 following the promulgation of the Polytechnic Law (PNDCL 321) which upgraded all the polytechnics in Ghana to the tertiary level (MOESS, 2008). In 2003, Wa and Bolgatanga polytechnics were established, bringing the total number of polytechnics to ten.

The mission and the mandate of the Polytechnics are to provide tertiary education to produce highly skilled personnel for national development in the field of manufacturing, commerce, applied science and technology ((MOE, 1993). All the polytechnics are state-owned with 3-year duration of training, offering vocational and technical oriented, career-focused programmes in the Engineering, Applied Arts, Science and Technology and Business studies leading to the award of the Higher National Diploma (HND). The National Board for Professional and Technician Examinations (NABPTEX) is responsible for developing the HND curricula, review the syllabi, conduct examinations and award certificates to the polytechnics graduates. In recent times, some of the polytechnics have introduced a 2-year post-HND program with a strong practical component where HND holders can continue their studies for the award of Bachelor of Technology (B. Tech).

Entry into the polytechnics requires completion of general Senior High School/Senior Secondary Technical School or general technical and craft courses at Technical and Vocational Institutes (TVIs). However, a large proportion of the students admitted into the polytechnics come from the general senior secondary schools rather than the technical and vocational institutes (Addy, 2008; NABPTEX, 2011). The main reason for this trend is that the content of English, Mathematics and Science offered in TVET institutions is lower than the level at senior high schools, making it difficult for applicants from the TVET to meet the admission requirements to the polytechnics.

1.2.1 Challenges in the Polytechnic education in Ghana

In Ghana, one of the major challenges confronting the tertiary education system is the relevance of training programmes to the changing needs of students, industry and society. In a study of the labour market about the performance of tertiary graduates in Ghana, Boateng and Ofori-Sarpong (2002) observed from the employers that most of the graduates lacked basic skills to complete simple routine assignment. As a result, some employers take prospective employees through longer orientation and probation schemes after which the best performing candidates are selected.

Like other professional institutions, the Polytechnic education in Ghana was established to provide career-focused education, skill training and opportunities for conducting practical research in collaboration with business and industry. However, a report by the Japanese International Cooperation Agency (JICA, 2001) on the Technical and Vocational Education

and Training (TVET) in Ghana revealed that "the curricula of the HND in the Polytechnics are more theory-oriented with theory-based form of assessment" (p. 49). A further report by the Technical Committee on Polytechnic Education ((Technical Report Series, 2001) also showed that NABPTEX, which is the main the Examining Body for the Polytechnic Education in Ghana, lacked the appropriate schemes for the assessment of skills, competencies, aptitudes and practical training in HND examinations. This means that the HND awards by NABPTEX are based on theory.

A tracer study on the performance of polytechnic graduates in the Ghanaian labour market by Boahin, Kamphorst and Hofman (2010) revealed skills deficiencies in some specific study programmes. For instance, in the Agricultural sector, inadequate skills in numeracy accounted for (43%), IT-professional skills (42%) and general IT-user skills were 40%. These inadequacies have resulted into migration of graduates, increasing rate of unemployment and graduates undertaking further training after completing their study programmes. Almost half of the graduates (43.8%) undertake professional training to either improve their job skills and knowledge or learn new skills to overcome deficiencies in their skill training. Among other reasons, changes in global economy and the desire of firms and industry to reduce cost of production and increase their profit margins have led to continuous refinement of their production processes, internal systems and marketing strategies which do not align with the training system of the polytechnics. As a result, there is continuous demand for skilled workers due to what is commonly referred by economists as 'technological bias' which states that at the same time that new technologies eliminate some jobs through automation, they create new higher skilled employment and up-skill existing jobs (Brown et al, 2008). The existence of supply-demand gaps does not only results into graduate unemployment but also affects the efficient use of public investment and resources in the polytechnic education.

Given these realities, innovation in the training system in the polytechnics is needed to bring out new teaching methods that will lead to better outcomes and performance of learners. Such outcomes include relevant knowledge, skills and competencies that are marketable either for the organization and their staffing demands, or for individuals to secure greater employability in the wider world of work.

It is in the light of these challenges that the Council for Technical and Vocational Education and Training (COTVET) was established in 2006 among other things to ensure the introduction of an industry-driven CBT in the TVET systems in Ghana. Across the country, the Ministry of Education (MOE) in collaboration with donor agencies such as the Canadian Development Agency (CIDA), JICA and The Netherlands Organisation for International Cooperation in Higher Education (NUFFIC) have introduced CBT to improve the quality of vocational education. The introduction of CBT in Ghanaian Polytechnics under the NUFFIC project focuses on the revision of curricula in five disciplines: Agricultural Engineering, Fashion Design Building Technology, Civil Engineering and Automobile Engineering.

1.3 Research question

The intent of this research is to evaluate the implementation of CBT in Ghanaian polytechnics. Successful implementation of CBT has been examined from different contexts including industry or enterprise, accredited training providers, staff development or vocational education and training levels (Smith, 1999, Lowrie et al, 1999, Mulcahy & James, 2000, Smith, 2010). In this dissertation however, the teaching and learning processes in the five main disciplines are explored. In this regard, two main research questions are addressed:

1. What lessons can be drawn from international experiences in CBT to support the implementation processes in Ghana?
2. To what extent has CBT implementation in the polytechnics successfully influenced the achievement of competencies required to perform professional tasks?

Evaluating the effect of CBT on the acquisition required competencies will be examined from three main perspectives. Firstly, examination will be done from the perspectives of lecturers, CBT students and non-CBT students in the area of modular structure, polytechnics and industry linkage and assessment practices. Secondly, investigation will be done on the perceived effects of CBT students on the acquisition of skills and attributes necessary to perform professional tasks. Thirdly, the effect of CBT will be assessed from the perspectives of study programmes and students' background characteristics and industry-based learning. Finally, the study will conduct a critical review of international experiences in the implementation of CBT and draw practical lessons to support Ghana.

The theoretical background of the study is presented in the following section. The theoretical framework considers implementation of educational innovations in higher educational institutions. It follows with the conceptions and theoretical approaches to competency-based education and discusses the international experiences in CBT implementation. The chapter concludes with the conceptual model underlying the dissertation and the outline for the study.

1.4 Models of innovation

Innovation is defined as the implementation of a new and improved knowledge, ideas, methods, processes, equipment and tools leading to new and better products, services and processes (Williams, 1999). Innovation is therefore, about individuals or groups implementing a creative method, ideas or new approach to bring about an intended change in their practices, roles, functions in the context of their wider world of work or community. Innovation can be 'supplied-pushed' by the availability of technological possibilities in production or 'demand-led' which is usually based on cultural, market or societal needs (Brewer & Tierney, 2010).

Innovations in higher education may take the form of (a) organization and management, (b) curriculum and (c) teaching and learning (Fullan, 1991, Mitchell et al, 2003, Mulder, 2004). Though, the focus of the study is on teaching and learning, innovation in this area does not differ very much from the other two areas in the sense that, they all play complementary

roles in the institution to achieve set goals in education. For instance, innovation in the curriculum may influence the way the teachers teach and students learn.

The introduction of a new teaching and learning method would affect the entry and exit of learners, leading to re-organization of courses, time-tabling and assessment procedures among the departments and faculties. In the face of such structural changes, management has the responsibility to build the capacities of the staff, acquire the necessary equipment and materials, organize workshops and conferences with its attendant cost implications.
Fullan (1991, 2007) provides a model of innovation that focuses on the roles and strategies of various change agents or participants who are expected to take part in innovation process. To this end, he identified four broad phases in educational innovation process. These are initiation (existence and support for innovations), implementation (characteristics of change, local and external factors), continuation (decision about institutionalisation of the innovation) and outcome (achieving the desired results). In this regard, seven premises have been identified that underpin successful implementation of educational change. These include a (a) focus on motivation (i.e. moral purpose, capacity, resources, peer and leadership support, identity etc.), (b) capacity building with a focus on results (developing individual and collective knowledge and competencies, resources and motivation), (c) learning in context, (d) changing context, (e) a bias for reflective action, (f) tri-level engagement (interaction and connectivity within and across the state, district, school and community) and finally, (g) persistence and flexibility in staying on course (Fullan, 2007, 2008).

Rogers (1995, 2003) provides diffusion of innovation as a model to explain the process by which innovation is communicated through different channels over time among members of a social system. The model provides guidelines for the change agents about the attributes that they can build into the innovation to ensure its acceptance or adoption. In this model each individual in the social system faces his or her innovation decision that follows a five-step process: (a) knowledge about the innovation and how it functions (b) persuasion towards the innovation (c) decision to adopt or reject the innovation (d) implementation, and (e) confirmation of innovation decisions already made. Essentially, Rogers' diffusion of innovations does not focus on persuading individuals to change, but rather it sees change as an evolution or reinvention of products and behaviours so they become better fits for the needs of individuals and groups (Rogers, 2003; Robinson, 2009).

Diffusion of innovations provides three useful insights into the process of change. These are the qualities that determine the success of an innovation (i.e. relative advantage, compatibility with existing values and practices, simplicity and ease of use, trial ability and observable results), the need for peer-peer conversation and peer networks and understanding the needs of different user segments (i.e. innovators, early adopters, early and late majorities and laggards) (Rogers, 2003; Robinson, 2009).
Both Fullan and Rogers' theories of innovation are useful in that they do not impose ideas, structures or standards in a top-down model on implementers. Rather, both change theories

engage all parties in the actual development, implementation and adaptation of innovation to meet local conditions. When participants are given opportunities to share ideas and opinions, it will not only encourage them to monitor the progress of the innovation but also have a sense of ownership of the innovation. The only striking difference is that while Fullan focuses on the roles and strategies of various participants, Rogers' framework focuses more on characteristics of innovation and adopters. Thus, in diffusion of innovations, it is not the people who change but the innovations themselves (Robinson, 2009).

From the foregoing, it is clear that innovation process is a complex journey that entails uncertainty with both positive and negative forces. This implies that problems and conflicts are essential part of any innovation process and that participants need a great deal of commitment and self-efficacy in order to achieve a successful change.

1.4.1 Conditions for successful implementation of educational innovations

In every environment, there are a range of factors that facilitate the adoption and implementation of educational innovations. Factors listed by Ely (1999) include:
dissatisfaction with the status quo, sufficient knowledge and skills, availability of resources, availability of time, reward and incentives, active involvement of stakeholders, commitment and leadership.

Mulder (2004) classified conditions for successful implementation of educational innovation into internal and external factors. The internal factors include characteristics of innovation and process of innovation while the external factors relate to context of innovation. The characteristics of innovation relate to the relevance of content of tasks to be performed by students, background characteristics of students, organization of learning, teacher's role and assessment practices. The process of innovation involves the design and implementation. The context of innovation relates to the school environment and the wider society and these include availability of classrooms and teaching materials, level of economic development of the nation and government educational policies.

Existing literature and previous studies on the implementation of innovative approaches to learning and assessment have a number of lessons to guide training institutions (Rogers, 2003; Michell et al, 2003, Robinson, 2009; Fullan, 2008).

- Innovation is context-specific and therefore requires an assessment of costs and benefits in terms of human, financial, physical resources, business environment as well as its relative advantage to the users such as economic advantage, social prestige, convenience or satisfaction.
- Implementation process of innovation requires radical shifts in attitudes, values beliefs and norms.
- Implementation of innovation must be built on previous or existing structures and practices such as values, norms, and past experiences in order to avoid conflicts in the transition process.

- All stakeholders must be involved in the early stages of development and implementation in order to promote a sense of ownership and responsibility for the innovation.
- Professional development is an integral component of the innovation process.
- A periodic assessment to find out how students are coping with new strategies and demands on their learning is crucial part of the implementation process.
- Implementation process requires evaluation in order to provide feedback on progress and experiences to improve upon the on-going innovation.
- A key group or person who will champion and drive the innovation development and implementation is essential.
- System and management support are crucial to sustain the innovation development and implementation process.

On the basis of the foregoing discussion, a conceptual model can be derived to explain the process of developing and implementing educational innovations. In Figure 1.1, the policy directions are usually provided from the education ministry, agencies or group of persons initiating the change process. The initiation process involves an assessment of all the enabling elements, which include of resources (human, financial, and infrastructure), the existing structures (skills of teachers, characteristics of students, industry-led agencies, and community participation), professional development of staff and support from management. These elements need to be mobilized in the implementation stage in order to achieve the desired outcome.

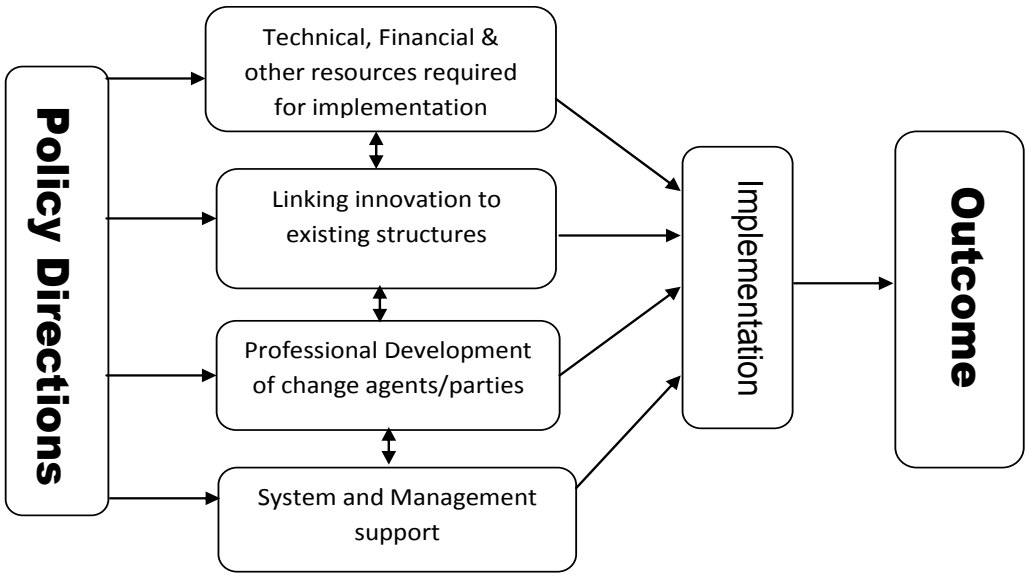

Figure 1.1 Development and implementation of educational innovation (Adapted from Michell et al, 2003)

In Figure 1.1, the policy directions assume direct effect on the enabling elements. These elements are interconnected and therefore require effective management to drive the innovation into the implementation process. The engagement of all stakeholders in the

implementation process is assumed to have direct effect on the outcome which may be changes in skills, training, products or services.
Over the years, attempts at teaching and learning innovations has been based on the criticism about the conventional seminar or lecture model in the higher education institutions where the lecturer is seen as 'sage on the stage'(Brewer & Tierney, 2010). Various labels such as chalk and talk, teacher-centred, one-way process establishing no contact between the lecturer and the student, up-front teaching model incapable of stimulating academic discussion of any value have been associated with these kinds of teaching methods (Silver, 1998; Figgis, 2009).

The need to identify innovative practices in the teaching and learning process is particularly crucial in the VET system because VET helps prepare people for work, develops their professional skills and knowledge while at work so that they can adapt to new or different occupations or working environment. Various attempts to explore creative ways especially in the face of the increasing number of students in HEIs and the rapidly changing global environment have resulted in individual-centred approaches, small group teaching, peer group learning and group assessment (Barkham & Elender, 1995; Hillier, 2009). The aim is to enable students to be actively involved in group work and also learn at their own pace. This learning process aims at enhancing the ability of students to be able to progress on the basis of mastery. One of such teaching and learning patterns in HEIs, particularly in the VET systems that seek to identify and develop key competences and relevant future skills to meet the needs of the labour market is competency-based training.

1.5 Definitions and conceptions of competence

Competence is defined as the ability to perform particular task and duties to the standard of performance expected in the workplace (DEEWER, 2007). On his part, Kouwenhoven (2011) views competence as the capacity to accomplish the key occupational tasks that characterize a profession to satisfactory standards. In this sense, competence involves the application of knowledge, specified skills, and attitudes necessary for effective performance in the industry or enterprise. It includes performance of individual tasks, managing range of different tasks, responding to contingencies or breakdowns, carrying out workplace responsibilities including working with others (Schofield & McDonald, 2004). This definition views competence as a functional, task-oriented and industry-focused system of training where individuals apply the relevant skills and attitudes in a required workplace environment.

The general concept of competence is also viewed in the light of core competencies which involve the set of appropriate competencies needed to accomplish a key occupational task at a satisfactory or superior level (Kouwenhoven (2011). These core competencies may be domain-specific that concerns clusters of knowledge, skills and attitudes within a specific content related to the profession or generic because they are required in all content domains which can be transferred to new professional situations.

The concept of competence is perceived by other authors in a more generic sense. For instance, Gonczi (1999) views competent person as one who possesses the attributes necessary for job performance to appropriate standards. Eraut (2003, cited in Weigel, Mulder & Collins, 2007) defines competency as the ability to perform the tasks and roles to the expected standards. Weigel et al (2007) also perceive competency as the capability to perform and to use the knowledge, skills and attitudes that are integrated in the professional repertoire of an individual. In all these definitions, competence is seen as a set of features and assumptions that describe the attributes of a competent individual.

Another view of competence is seen as recognition of complex interaction of people, skills and technologies that drives company performance (Le Deist & Winterton, 2005). In this sense, competence is dependent on the context or organizations and that people tend to perform different competencies at different contexts and circumstances. The importance of contexts in the concept of competence is particularly important because a particular knowledge, skills and attributes of an individual may be valued differently in different organizations and contexts. This means that there is the need for flexibility in the standards of performance considering the changing labour market demands for skills needed by businesses, industry and organizations.

1.5.1 Theoretical approaches of competence-based education (CBE)

On the basis of these conceptions and definitions of competence, CBE can be traced from two main perspectives; namely: the behaviourist tradition as practised in the USA, UK and Australia, and the holistic tradition in France, Germany, Netherlands and Austria (Biemans et al, 2004; Le Deist & Winterton, 2005). Particularly, the behaviouristic conceptualisation of competence originated from the USA in the 1960s where the term competency (emphasis on 'y' and 'ies') was associated with the performance-based teacher training and labeled as competency-based education (Chappell et al, 1995). It was based on the views of educational theorist Ralph Tyler (1902-94) who promoted the idea of developing behavioural objectives into the design of curriculum and instruction which provided three related components, namely; performance, standards, and conditions, for breaking down learning objectives in curriculum design. It was thought the learning programmes should be assessed in terms of changes that occur in learner's behaviour.

Unlike the traditional sequenced programmes, learners could achieve mastery of prescribed competencies at their own pace while students' performances were evaluated by criterion-referenced assessment (Chappell et al, 1995; Hodge, 2007; Murray, 2009).The behaviourist defines CBE in a narrowly-focused and occupationally-specific manner. It places too much emphasis on what the individual can do and pay little attention to the underpinning knowledge, values, attributes, meaning, intention and effect of interpersonal and ethical issues (Gonczi, 1996).

The Holistic approach rather views CBE in a broader context and integrates personal aptitudes, ethical and cultural values in the training program. The holistic perspective

means that competence is viewed from the context in which it will be used, together with the personal or behavioural, cognitive and ethical components (Cheetham and Chivers, 1996). It also means that training delivery and assessment processes must be interrelated and must occur in relevant workplace or simulated contexts. It must be emphasized that the needs of a constantly changing industrial society can never be met by narrowly skills training which neglects aspects of general education. This is based on the premise that, the main goal of education is to prepare an individual for life, which involves not one occupation or role but a multiple of roles in order to function effectively in one's community. Moreover, if CBE is viewed from the behaviouristic perspective, some human and community services that require attitudinal or behavioural changes is likely to throw away some values and ethical standards underpinning certain professions.

Recent attempts to capture both generic and occupationally-specific competencies in the definition and conception of competence have led to the development of three competency models; namely the behaviourist, generic and cognitive approaches (Weigel et al, 2007). The behaviourist emphasizes on the importance of observing effective job performers in order to distinguish high and low performers. The generic approach identifies the common abilities that explain differences in performance. The cognitive approach includes all the mental resources of individuals that are used to acquire knowledge, perform tasks and achieve successful performance.

Cheetham and Chivers (2006) have further developed a holistic model of professional competency that consists of five interrelated competencies. They are:

- Cognitive competence that involves knowledge (know what) underpinned by understanding (know why).
- Functional competencies (skills or know how); things an individual should be able to do and demonstrate
- Personal competency (behavioural competencies); individual characteristics that make a person to behave effectively.
- Ethical competencies possessing appropriate personal and professional values and abilities to make sound judgments in a work related situations.
- Meta-competencies; ability to cope with uncertainties, capacity to learn and embrace change.

Evidently, the concept of competence is an on-going process of continual change and development of new ideas and models. This is the results of changes in technology, industry restructuring and labour market demands (Harris et al, 1995). The foregoing definitions show that competence is generally viewed as combination of knowledge, skills, personal attributes and attitudes in the performance of a particular task to specific standards. However, competence is not only a journey, but also a context-dependent. In other words, competence goes beyond formal education and training and includes all life experiences and capacities which have been developed over a life's span. This implies that concepts of competency must be seen as an integrated form of training in order to derive other learning approaches such as problem-based learning, authentic learning inductive and

exploratory learning in the training systems. Furthermore, any competency model needs to provide broader contexts of competency standards in the training system in order to facilitate diverse pathways and recognize the value of individuals' formal and informal learning in diverse contexts and circumstances (Mulder et al, 2006).

1.5.2 Characteristics underpinning the curriculum development of CBE

On the basis of the foregoing views about the concepts of competence, the following characteristics are said to underpin the development of competence-based education (CBE) curriculum (Kouwenhoven, 2003).

- CBE is oriented to the professional practice. This means that future occupational practice of the student must be the pivot around which the curriculum should evolve.
- CBE is learner-centred and the learning process is central. Therefore, learning approach must involve individualized materials, flexible learning time and continuous feedback to the learner (Guthrie, 2009; Hattie, 2009).
- CBE is based on constructivist approach and that the individual must be actively involved in the acquisition of knowledge and skills.
- In CBE the teacher's role is that of a 'cognitive guide' that encourages students to engage in active inquiry in the learning activities.
- CBE provides learning environments that promote the development of competencies.
- CBE includes the development of generic competencies which are integrated in the curriculum to stimulate transfer in a variety of settings.
- Assessment of CBE focuses on competencies and includes both formative and summative.
- CBE curriculum development is based on the elaboration of profiles and identification of competencies required in the performance of a professional task.

The characteristics of CBE require new teaching and learning roles of both teachers and students in the instructional processes. As teachers shift away from the traditional 'chalk to talk' to become a facilitator, an adviser or coach (Mitchell et al, 2003), learners need to be active and exploratory in the training programmes (Swailes & Roodhouse, 2004; Cremers et al, 2005).

1.5.3 Teaching and Learning theories of Competence-based vocational education

The introduction of CBE demands new roles and pedagogical skills in the teaching profession. Teachers in CBE need to change their traditional role as an information provider to become an expert, coach, assessor, educational developer, researcher and manager (Gauld and Miller, 2004, Tigelaar et al, 2004, Seezink, 2009, Wesselink, 2010). In the role as an expert, teachers must possess relevant knowledge of the subject matter, be abreast with current development in businesses, organization and society, learn from the experiences of the students and professional practice and translate them into his or her educational practices. As a coach, the teacher must facilitate students' learning by providing regular interaction with students, identify individual learning needs, initiate

feedback dialogue with students and encourage them to achieve their learning goals. The teacher's role as an assessor is to evaluate, diagnose and monitor students' competence levels, assess projects and ensure that assessment is carried out with industry personnel in an authentic environment. As a researcher, teachers must constantly conduct new studies to be able to apply the results into his or her educational practice in order to be abreast with the rapidly changing knowledge-based economy. Being an education developer, the teacher must design learning activities, develop resources to supplement real work activities and assessment procedures with other colleagues. As a learning manager, teachers need to cooperate with other stakeholders relevant to the learning process such as staff members, workplace trainers and parents towards the achievement of learning goals.

These new roles of teachers emphasize two main teaching theories in competence-based vocational education, namely: the cognitive apprenticeship model (Collins et al, 1989) and the acquisition and participation metaphors of learning *(*Sfard, 1998; Hager, 2004). The cognitive apprenticeship models specifies four dimensions necessary for designing and implementing competence-based learning environments in VET systems (Seezink & Poell, 2010). These include *content, method, sequence* and *sociology*. While the 'content' describes different types of knowledge, such as domain-specific or heuristic and learning strategies, the 'method' considers teaching strategies in CBE such as modeling, coaching, scaffolding, articulation, reflection and exploration. The 'sequence' dimension prescribes the logical arrangement of learning materials to meet the needs of different learners under three main principles; increasing complexity, increasing diversity and global before local skills. The 'sociology' dimension also refers to the social context of the learning environment, particularly in authentic conditions ((Loyens and Gijbels, 2008).

The second framework for CBE theory of teaching is the 'acquisition and participation metaphors of learning'. The acquisition metaphor of learning refers to the process of acquiring knowledge from the outside world into the learners' cognitive structure or mind. The learner's prior knowledge and experiences must be recognized, refined to be used as cognitive framework for advanced learning. The participation metaphor, also referred to as 'enculturation' regards learning within the social context where newcomers master specific skills and knowledge from the experienced ones in order to become active participants in the socio-cultural practices of a community (Seezink & Poell, 2010).
It must be stressed that these theories of learning are not mutually exclusive and that some elements of parallels can be drawn between them. For instance, the participation metaphor is closely related to sociology dimension of the cognitive model as both emphasize learning within the social contexts. In the same way, the acquisition metaphor of learning is very much related to the principles within the content dimension of the cognitive apprenticeship model because both dimensions refer to the need for teachers to recognize the prior learning of learners so that future learning can be built on it. Essentially, both theories provide useful framework to find out the extent to which the key features of CBE have been utilized in the implementation processes. More significantly, these theories emphasize

the fact that CBE is based on constructivist learning principles that allow students to be actively involved in the learning process within an authentic learning conditions (Loyens and Gijbels, 2008).
It must be emphasized that acquiring and developing competences is more than learning a set of skills (Kouwenhoven, 2009). Generally, the term CBE describes the acquisition and development of competences while 'training' as in Competency-based training (CBT) is more concerned with the mastering of specific knowledge and skills. As the dissertation focuses on knowledge and skills acquisition within training programmes, the term CBT will be used throughout this dissertation.

1.5.4 Competence-based training

Competence-based training (CBT) has been defined as an approach to training that places emphasis on what a person can actually do as a result of training (ANTA, 2003). Robbinson and Misko (2003) also perceive CBT as training which develops the skills, knowledge, and attitudes required to achieve competency standards. The main idea behind the introduction of CBT in the VET of many countries is to move away from the time-served approach to training to one based on the mastery of competency standards. Secondly, it is a shift from the supply or producer/educator-driven approach to and industry-led training system.

Various literature and policy documents describe the characteristics of CBT as: (a) based on competency standards (b) modular format (c) outcome and not input or process focused (d) industry involved/led (e) flexibly delivered, involving self-paced approaches
(f) performance-oriented (g) assessment based on criterion-referenced rather than norm-referenced and allowing for recognition of prior learning (Smith & Keating, 1997; Guthrie, 2009).

Although raising technical skills of workforce is important, it is not adequate in the context of rapid pace of technological change and high labour mobility. In other words, mastery of a job-specific task does not ensure a competent employee. Individuals require the capacity to be flexible, take initiative and exhibit adaptability to different settings by means of employability skills (Neilson 2007). Studies show that industries are in constant search of employees who are capable of combining these technical skills with employability skills in innovative and productive ways for effective participation in the emerging patterns of work and organization (Mayer Committee report 1992; Brown et al, 2008).

1.6 Recognition of prior learning (RPL)

The concept of RPL is defined differently among countries due to differences in the usage and implementation strategies. In Australia, New Zealand and South Africa, the term RPL is used while in the UK, the accepted term is Accreditation of Prior (Experiential) Learning (APEL). In the USA and Canada, it is Prior Learning Assessment (PLA), although Accreditation of Prior Learning is sometimes used in Canada. The concept of RPL is understood by most people in the area of adult education as a method of assessing relevant competences gained through work and life experiences, which can then be counted towards

qualification and for promotion in the workplace through the use of systematic set of procedures (Harris, 2000). In the context of VET, RPL refers to the practice that enables competences acquired by students in various circumstances to be recognized and accredited as part of their studies or qualification. Students' prior learning is recognized regardless of how, where and when they were acquired. In the process students become responsible for demonstrating, proving and providing adequate information on their competences. The process also enables students to evaluate their competences in relation to the goals in their study programmes.

The main goal of RPL is to recognize and acknowledge individuals' competence and knowledge regardless of how and where it has been acquired (Freitag, 2007; Stenlund, 2010). It also provides diverse and inclusive pathways to learning especially for students from disadvantaged backgrounds and to promote life-long learning (Stenlund, 2010).
The notion of recognizing and accrediting what individuals already know and can do is gaining significant impact in the training programmes in many countries. As the world resources keep on dwindling in the face of rapid population increases, employers, human resource development specialists and government policy makers have a common goal of optimizing existing resources, maximizing available infrastructure and personal qualities by providing opportunities where every individual can make maximum use of their potentials (Moore and Rooyen, 2002). Educators and trainers are concerned that too much valuable time and effort is lost, teaching people what they already know and can do.

RPL has become an integral part of CBT because there is no difference between the concepts, procedures and tools in RPL and CBT assessment processes. Both RPL and CBT assessment involve monitoring and assessing competences a person has, irrespective of where and how these competences were acquired. Consequently, both RPL and assessment of CBT emphasize three principles, namely assessment of evidence, current abilities and standards or competences.

In Ghana, RPL has the potential to be a powerful tool for the development of human capital in the CBT implementation. Many skills acquired informally through self-learning or apprenticeship are not recognized (Palmer, 2009). Although a greater percentage of Junior and Senior High School (JHS/SHS) leavers engage in training provided by mastercraft personnel in various trades, (Doudu, 2006), there is no well-defined progression or training pathways within the whole VET system in Ghana, making it difficult for these trainees in the informal sector to obtain opportunities for higher levels of qualification. For education and training in Ghana to be accessible to all, then individuals must be encouraged to continually acquire new skills and gain reward and recognition for existing skills, experiences and learning previously acquired. Appreciation and recognition of prior learning will motivate learners to continue learning to develop the self to be able to solve problems in life and employment.

1.7 The notion of employability skills

Employability skills have different meanings as different terms are used by different countries to describe it, although with considerable overlap. In Australia and the UK, employability skills are defined as competencies, personal attributes and values that should be acquired, not only to gain employment but also to progress within an enterprise to achieve both individual's potential and the enterprise's strategic goals (Neilson 2007). In USA, employability skills describe foundational skills on which a person builds job-specific skills. Gibbs (2000) argues that the notion of employability goes beyond the possession of technical skills to feature less factual, value-driven uses of practical judgment in the workplace. Thus, employability refers to both external skills and the character and attitudes of an individual. In contrast, Hughes and Stoner (2001) prefer the term 'deployment skills' deployed in employment situations as a form of self-presentation, self-confidence and basic work habits.

Employability skills apply to all kinds of work and work organization and not specific to a particular occupation or industry. Therefore, in CBT, employability skills form integral part of the design and structure of study programmes, assessments and staff development (Guthrie 2009). These competencies equip individuals to function effectively in a wide range of social settings, workplaces, further education and adult life (Guthrie, 2009, Kouwenhoven, 2011). Although there are variations of employability skills across VET systems, several key skill groupings appear common to many institutions and these include basic skills such as literacy, numeracy and ICT skills, interpersonal skills such as communication, teamwork, and personal attributes such as, creativity, problem-solving, capacity to learn and adapt to changes in the workplace or organization (Gibb, 2004). These key competences are embedded within competency standards and that assessment guidelines must provide broader performance criteria so that assessors can make valid inference from the learners' performances.

The major stimulus for increasing interest in employability skills is in response to high labour mobility and the fact that current jobs require flexibility, initiative and ability to undertake many different tasks. In a knowledge and information-based economy posed by globalisation, most jobs are becoming more service-oriented, making information and social skills increasingly important. Thus, jobs in business, finance, insurance and retail sectors require interpersonal skills, customer handling skills, communication and general IT user skills to respond to client needs. Similarly, manufacturing and craft workers often work with more complex processes and therefore require greater thinking, reasoning, problem-solving skills and team work to operate machinery or deal with faults. Therefore, prospective employees need to acquire a broader range of skills, professional competencies and attitudes to continually adapt and transfer skills and knowledge in different contexts. Thus, industries recruit and retain employees who are capable of combining technical skills with professional competencies in innovative and productive ways for effective participation in the emerging patterns of work and organization (Mitchell et al, 2006; Gibb and Curtain, 2004; Brown et al, 2008). A study by Australian Industry Group revealed that

over 90% of the firms were looking for people who are flexible and adaptive, willing to learn on the job, team workers, technically competent and committed to excellence (Allen Consulting Group, 2006). Studies demonstrate that people with proactive skills, for example, engage in more self-directed learning (Jossberger et al. 2010).

An on-going debate in the literature is whether or not employability skills are taught within academic disciplines or promoted in industries. Some authors are of the view that employability skills are best promoted in industries, agencies or extra-curricular activities in work contexts (Green et al. 2009; Stiwne and Jungert 2010). Crebert et al (2004) find that industry-based learning, internships, structured work experiences and employer involvement in course design and delivery improve the generic skills of students in different disciplines. Other authors however, argue that employability skills can best be acquired in specific disciplines, particularly those that involve more student-centred learning (Ghana MESC, 2004, Barrie 2005). These skills are fostered through a more student-focused approach to teaching, such as enquiry-based, problem-based, reflective learning and authentic work experiences that provide more opportunities for students to explore their own creative ideas (Trigwell, 2002). Despite these debates, studies show that teachers do not integrate these competencies into their learning and assessment strategies (NCTVET 2006; Barrie 2005). In Ghana, feedback from employers' surveys indicates that polytechnic graduates offer weak employability skills, particularly in terms of problem-solving, organizational skills, ICT, communication and teamwork (Boahin et al, 2010).

1.8 Philosophy and experiences in the implementation of CBT

The implementation of CBT has been controversial as many authors and researchers have different views about the impact of this learning innovation. Their assessment is based on the extent to which CBT is meeting the requirements of the various stakeholders, namely: industry, employers, training institutions and workers. CBT implementation is said to have brought closer collaboration between industry and training institutions. In the context of teaching and learning, this partnership is said to have increased strong linkage between theory and skills, industry-focused curricula, student-centred, active and exploratory form of learning among trainees (Swailes & Roodhouse, 2004, Cremers et al, 2005). At the enterprise level, CBT has resulted to increased skills for achieving business goals such as improved productivity, efficiency, effectiveness and production of quality product (Callan & Ashworth, 2004). Employees or workers are able to adapt to changing organizational structures and business practices. As noted by Mulcahy and James (2000), 'the bottom line' for enterprises is relevant training where relevance means 'doing the job' to a pre-set standards. In addition, CBT also functions as a mechanism for workforce supervision and appraisal system. In Britain for instance, the use of standards in the NVQ's was found to have helped not only to raise skills levels, but also as procedures for recruitment, selections and performance review (Swailes & Roodhouse, 2004).

However, CBT implementation in many countries have attracted a lot of criticisms from researchers and practitioners to the extent that some critics have categorized them into

philosophical, technical defects, pedagogical, centralization and control as well as lack of teacher capability (Smith & Keatings, 1997; West, 2004; Smith, 2010).

Conceptually, CBT is criticized as too behaviouristic since it ignores the connections between tasks, the contexts and attributes that underlie the performance and the effect of interpersonal and ethical aspects (Gonczi, 1996). As CBT is about what a person can do, training delivery is often narrowly focused on the expected outcomes to the neglect of the underpinning knowledge and values. Another challenge facing practitioners, authors and researchers of CBT is the confusion surrounding the uses of the terms competence, competency, competences, competencies, and competency models or assessment. Lack of common usage of these terms and poor conceptual clarity have resulted into different kinds of models, principles and characteristics, curriculum development and assessment practices in many VET systems (Merriënboer, Klink and Hendricks, 2002).

Assessment practices remain one of the contested issues in the implementation of CBT. Teachers argue that assessing students' with industry personnel means a loss of professional autonomy because most the industry staff do not have technical capacity to make judgment on students' performances (Biemans et al, 2004, Hellwig, 2006). Other setbacks in assessment practices include use of both criterion and norm-referencing, labour intensive, time-consuming and financial constraints. Non-graded form of assessment which is purely based on demonstration of competence is also criticized as a means of promoting mediocrity and discourages excellence or expertise among students (William & Bateman, 2003). Critics argue that grading provides comprehensive information and pathways for employment, selection process for further study and award purposes rather than just 'competent' or 'not yet competent'. However, there is an increasing support for the use of portfolios in many VET systems to provide sufficient documentary evidence on the student's performance profile such as certificates, references from past employers, testimonials and work samples. This process is said to help not only in recognizing prior learning but also ensure that evidences of competence are gathered and properly documented from a wide range of sources (Guthrie, 2009).

1.9 Conceptual model

Competency-based training is believed to have the potential of equipping trainees with the needed skills and competencies to function effectively in the labour market (Arguelles & Gonczi, 2000). Evaluating the contribution of CBT in a number of industries and enterprises in Australia, employers reported that learning can be achieved on-the-job but further suggested the need for high quality instruction that goes beyond the specified competencies to include outcomes related to innovation and future operations at the workplace (Mulcahy & James, 2000). This makes it imperative for teachers to recognize the background characteristics of the learner (previous knowledge, skills and experiences, social context, gender, etc) as cognitive framework in their training delivery in order to pursue future learning objectives in a variety of contexts.

As evaluation is part of the implementation of every innovation (Michell et al, 2003), this study evaluates the teaching and learning processes of CBT in Ghanaian polytechnics in order to use the feedback from the implementation experiences to improve upon the innovation. To this end, a conceptual model in Figure 1.2 has been composed to find out the potential effects of some key variables on the achievement of competence. The policy context represents the government's educational policy and accreditation requirements that form the national training framework for all stakeholders in the implementation process. As the end-user of education and training, industry need to collaborate with training institutions to develop industry-focused curriculum, training delivery and performance criteria, quality assurance and apprenticeship programmes. Training institutions also provide environment for teaching and learning, equipment and learning materials in the study programmes to achieve the required competencies necessary to perform professional tasks.

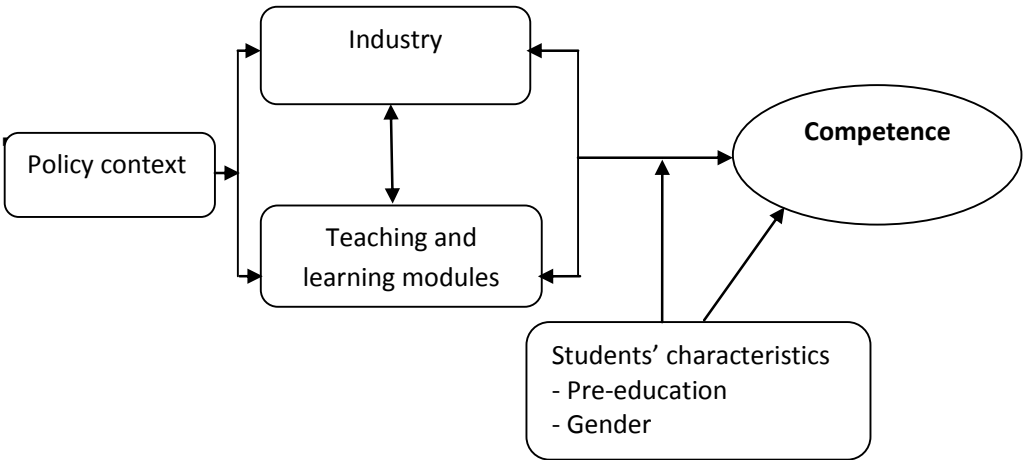

Figure 1.2 Conceptual model for CBT implementation in Ghanaian polytechnics

In Figure 1.2 the policy context, represented by the government educational policy, funding, accreditation and quality assurance procedures, assume direct effect on both industry and teaching and learning modules used in the training institution. Industry participation in CBT refers to the active collaboration between industry and training institutions towards the development of competency standards, internship programmes and quality assurance. Both industry and training institutions have reciprocal effects because the two features need to work together in the training activities. Teaching and learning modules refer to the breaking down of the curricula of the study programmes into independent units called modules with the aim of ensuring mastery of each task before progressing to a more advanced level. Each module represents a certifiable part of a job and therefore can be studied separately to acquire the specific competencies needed for a job. Incorporated in the teaching and learning modules is recognition of prior learning as a tool to recognize and accredit previous and existing learning experiences, encourage self-assessment and build learner confidence towards the achievement of the desired goal.

Effective collaboration between industry and training institution through the teaching and learning modules is assumed to have a direct effect on the achievement of competence. We also expect students' previous education and gender under background characteristics to exert a direct effect on competence or assume an interaction effects with industry and teaching and learning modules towards acquisition of competence. Achievement of competence is indicated by the utilisation of CBT features towards acquisition of skills and attributes required for the performance of professional tasks.

1.10 The structure of this dissertation

This dissertation is organised into seven chapters:

Chapter 2 provides an overview of the data and methodology used in this dissertation.

Chapter 3 deals with the international experiences in the implementation of CBT with particular focus on recognition of prior learning and involvement of industry towards the achievement of employability. It provides a critical review of the experiences of CBT implementation in the United Kingdom (UK) and Australia with the purpose of drawing some useful lessons for Ghana and other countries with emerging VET institutions. This chapter aims at providing an answer to research question 1.

Chapter 4 examines the effectiveness of CBT implementation in Ghanaian polytechnics in relation to linkages between industry and polytechnics, use of a modular structure and assessment practices. This chapter provides a partial answer to research question 2.

Chapter 5 examines the perceived effects of competency-based training on the acquisition of skills and attributes to perform professional tasks. In a more detail, this chapter assesses the use of modular structure, involvement of industry, and assessment practices in acquiring the needed competencies to perform professional tasks. Furthermore, the mediating roles of quality of teachers and feedback in acquiring skills and attributes are also examined. Just like chapter 4, this chapter aims at providing partial answer to research question 2.

Chapter 6 addresses the effect of students' study programme on achievement of employability skills. In specific terms, this chapter examines the potential influence of each of the five study programmes of CBT, students' background characteristics such as previous education and gender as well as industry training in assisting students to achieve required competencies to perform professional tasks. This chapter aims to provide a complementary answer to research question 2.

Finally, chapter 7 provides a summary and discussion of the main findings of the previous chapters and their educational implications. This chapter further discusses the strengths and limitations of the approaches used and suggestions for future research.

Chapter 2

Methods

2.1 Background of CBT introduction in the Polytechnics

As already mentioned in the introduction, this dissertation aims at finding out the perceived effect of CBT on the teaching and learning process in Ghanaian polytechnics. (The study is conducted within the framework of the project NPT- GHA/142, Capacity Building for Supervisory Bodies of the tertiary Education in Ghana). The main aim of introducing CBT is to improve the quality of vocational educational system by equipping graduates with the required workplace and professional skills, promote a stronger, demand-driven working relationship with employers and reduce graduate unemployment (NFP-NPT Newsletter, August 2005).

The CBT in Ghanaian polytechnics covers five disciplines: Agricultural Engineering, Fashion Design, Building Technology, Civil Engineering and Automobile Engineering. Each of the ten polytechnics offers one of these study programmes as CBT. Although CBT introduction began in the polytechnics in 2004, full implementation of study programmes started in September 2006. More specifically, Agricultural engineering programme is offered by four polytechnics, Civil Engineering is run by two polytechnics, Building Technology also by two polytechnics, Automobile Engineering by one polytechnic and Fashion Design is also offered by one polytechnic. The revision of the curricula of these study programmes involves a strong component of practical training, well-structured industrial attachment, adequate resources for training and increased participation of industry personnel in curriculum development, training delivery and assessment practices. The focus is to infuse technical skills with practical work experience and generic skills to build skill competencies that a learner must demonstrate in order to be seen as having an established and formally recognized proficiency. Furthermore, professional training programmes for the staff of the polytechnics and tertiary supervisory bodies on the new roles and methods of delivering CBT programmes have been undertaken at the local and foreign institutions to strengthen and sustain the projects and improve the quality of vocational educationand the manpower needs of the country.

Assessing the impact of any educational innovation such as CBT could be done internally or externally. While the internal assessment concerns the pedagogical practices including internship, the external relates to graduates' performance in the labour market. This dissertation focuses primarily on the internal effects of CBT implementation in the polytechnics.

2.2 Design

The study was carried out in two phases, namely: the baseline and a follow-up studies. The design is a repeated cross-sectional or pseudo-longitudinal study because the individuals involved in the baseline and follow-up studies were chosen from the same sampling frame. The repeated cross-sectional design was used because at the time of conducting the baseline study, there were only first and second year students in the CBT programme. It was therefore necessary to include the successive batch of students in the follow-up study so as to obtain a large sample size of students with broader range of views and experiences in the CBT programmes. Participants in the baseline study included the existing first and second year CBT students and third or final year students pursuing same programmes but not in competency-based mode (non-CBT students). Participants in the follow-up study however, were all CBT students, made up of 19.7% from the first year, 28.8% from second year and 51.5% from third year. This implies that a greater percentage of the students in the follow-up study also participated in the baseline study.

The cross-sectional design is appropriate for studies aimed at finding out the prevalence of a phenomenon, situation, problem, attitude or issue by taking a cross-section or subgroups within the population (Kumar, 2005, Levin, 2006). It is useful because it provides overall picture of the target population at the time of investigation. In the context of CBT implementation, the cross-sectional design is appropriate to investigate issues such as the characteristics of students and teachers and their attitudes towards CBT implementation, satisfaction of students and teachers with the implementation, possible relationship among the variables and the skills performance, effectiveness and challenges in the implementation process. Even though one major limitation of cross-sectional study is that it is a one-shot or status study and therefore makes it difficult to measure social or behavioural changes over varying periods of time and to detect causal connections among the variables (Sekaran & Bougie, 2010). Nevertheless, a repeated study for at least two measurements from almost the same sampling frame of population is likely to capture relevant issues and measure dynamic changes in the implementation process. Moreover, relying on same participants for large scale study of ten polytechnics in the whole country demands time and resources. It is also likely that most of the target group may not always be accessible or available for participation due to geographical mobility, attrition or unwillingness to continue to cooperate with the study as is usually the case in longitudinal studies (Miller & Salkind, 2002; Sekaran & Bougie, 2010). It is rather easier and cost-effective to resample many new subjects than to repeatedly sample from the same group of subjects especially when the subjects are dispersed.

Despite the limitation of causal inference in cross-sectional study, a full understanding of causal networks may not always be a necessary or sufficient condition to describe behaviours or determine the nature of prevailing conditions, practices, attitudes or effectiveness of CBT implementation. If properly designed and cautiously interpreted,

cross-sectional study provides a useful methodology to assess or evaluate an implementation of a programme or curriculum innovation.
The first phase which is considered as a baseline study was conducted in 2007 to assess the prevailing conditions in the implementation of CBT in the five piloted programmes in the polytechnics. It also investigated the extent to which the polytechnics were adapting their educational practices in the context of CBT. Participants were drawn from first and second year students in CBT programmes (CBT students), third year students in the same programmes but not CBT (non-CBT students), lecturers teaching CBT courses and the polytechnic administrators. The non-CBT were mainly final year students without first or second year group and whose programmes were about to be phased out with the introduction of the CBT system. Although the non-CBT students in the third seemed to have more experience than the first and second year CBT students, the comparative study was necessary to determine in what ways curriculum design and lesson delivery influence teaching and learning between the CBT and non-CBT programmes. It also meant to assess the extent to which the polytechnics were adapting their educational practices in the context of CBT. The results of the baseline study was used in chapter four to investigate the extent to which the polytechnics are adapting their educational practices in the context of CBT particularly in the area of industry participation, use of teaching and learning modules, assessment practices and grading format.

The second phase of the study also considered as the follow-up study was carried out in 2009 to find out the perceived effects of CBT towards the acquisition of skills and attributes to perform professional tasks. This study focused on CBT students because the traditional system of the programmes under review had been phased out. The outcome of the follow-up study addressed 'the perceived effects of CBT on the acquisition of skills and attributes' in chapter five and 'a disciplinary perspective of CBT on the acquisition of employability skills' in chapter six.

2.2.1 Sample

In the baseline study, a sample of 540 students, made up of 270 students of CBT and 270 students of non-CBT was drawn from a population of 1012 students. Out of this number, (251) 93% of CBT students and (208) 77% of non-CBT students participated in the study. Among the CBT students were 206 males and 45 females while the non-CBT consisted of 184 males and 24 females. About 70% of the CBT group was in their second year while 30% of them were in their first year of study. Participants in the non-CBT were final year students and the last batch of students in the traditional system of the programmes under review. Table 2.I shows the target and accessible populations, participants, response rate, males and females in both the baseline and follow-up studies.

Table 2.1 Participants in the baseline and follow-up studies

Study	Type of respondent	Target Pop.	Access Pop.	No. Part	% Resp	Males	%	Fem.	%
Baseline	CBT-students	610	270	251	93	206	82	45	18
	Non-CBT students	402	270	208	77	184	88	24	12
	Teachers	128	75	61	81	58	95	3	5
	Administrators	43	20	17	85	17	100	-	-
Follow-up	CBT students	1103	500	316	63	267	85	49	15

From a total of 128 lecturers from the five programmes under review, a sample of 75 lecturers was selected for the study. Out of this number, (61) 81.3% lecturers participated in the study. The lecturers in the study consisted of 58 males and 3 females. All the participants were full-time teachers in both the CBT and the non-CBT programmes with an average of eight years teaching experience in their fields of specialty. About 66% of the lecturers also had three year experience in teaching CBT courses and 72% had five years of related work experience.

The polytechnic administrators included heads of department and deans of faculty. Out of the 20 administrators drawn from a population of 43 administrators in the polytechnics, (17) 81% of them participated in the interview. They were made up of 11 heads of department (HODs) and 6 deans of faculty (DOFs) all of whom were males. The high number of males in the study may be due to the fact that, apart from Fashion Design, all the other CBT programmes were engineering-based and apparently male-dominated. Table 2.2 shows the distribution of participants in the two studies by study programmes.

Table 2.2 Baseline and follow-up studies by study programmes

Study programme	Baseline		Follow-up		Total
	No. of participants (B)	%	No. of participants (F)	%	(B)+(F)
Agric Engineering	82	32.7	124	39.2	206
Auto Engineering	14	5.6	34	10.8	48
Building Technology	50	19.9	61	19.3	111
Civil Engineering	63	25.1	68	21.5	131
Fashion Design	42	16.7	29	9.2	71
Total	251	100	316	100	567

The follow-up study consisted of 500 students of CBT which was drawn from a population of 1103 students in five CBT programmes. Out of this number, (316) 63.2 % students participated in the study. In order to obtain a more broader and experienced views, about two-thirds of the students was drawn from the final and second year classes because most

of them participated in the baseline study. Participants from the five programmes were Agricultural Engineering (124), Automobile Engineering (34), Building Technology (61), Civil Engineering (68) and Fashion Design (29). The students were made up of 84.6% males and 15.4% females. Among the participants, 66.8% of them entered the polytechnic through Senior High School, 17.9% attended Technical and Vocational institutes and 15% completed Colleges of Education and other higher institutes. In order to obtain a broader range of views and sufficient experiences in the CBT programme, 51.5% of the students were drawn from the final year group, 28.8% from the second year and 19.7 % from the first year group.

2.2.2 Data collection procedure

The data collection process in the baseline study began from November 2007 to March 2008 to allow the first year students of CBT to gain a whole semester's experience in their training to enable them to respond appropriately as their counterparts in the second year. Similar questionnaire were distributed to the third year students in the same programmes but not run as CBT (non-CBT students). The aim was to compare differences in the teaching and learning processes between the CBT and the traditional programmes. The CBT teachers also received a set of questionnaire that covers the same scope as the students but with different structure and content.

In each polytechnic, a face-to-face interview which lasted between 60 to 90 minutes was also conducted on polytechnic administrators by the use of an interview guide. A total of eleven HODs and six DOFs participated. The interviews were recorded on an MP3 device which were later transcribed and analysed. The results provided in-depth information on range of issues related to CBT implementation in the polytechnics which were used to triangulate the responses from both teachers and students.

The follow-up study began from November 2009 to February 2010 and the questionnaires were solely administered on CBT students because the traditional programmes had been phased out. As students remain the focal point of CBT (Jonnaert et al, 2007, Wesselink, 2010), the questionnaires were designed primarily for students to obtain their assessment of CBT implementation in the polytechnics from their perspectives as individuals and from their different study programmes (refer to chapters 5 and 6). In view of poor internet facility in the polytechnics, the instruments in both studies were personally administered and retrieved in order to ensure high percent rate of return.

In each phase of study, the first visit to the polytechnic was used to administer the questionnaire and the subsequent visits were meant for the retrieval of the questionnaire. With the cooperation of the various DOFs and HODs of the study programmes under review, an opportunity was provided to meet the teachers and students in each of the programmes to brief them on the purpose of the study, assurance of respondents' in terms of confidentiality and anonymity, instructions for completing the items and request for their cooperation. In order to enhance the response rate of the questionnaire, HODs received reminders via telephone calls and emails.

2.2.3 Instrumentation

The different variables in the research were measured by questionnaire and interviews. Both measures in the study explored areas such as students' background characteristics, development of curriculum, organization of teaching and learning modules, pedagogical practices and learning culture, adequacy of teaching and learning materials, assessment and grading, industrial attachment, successes, challenges and recommendations for the improvement in the teaching and learning processes.

In the baseline study, the questionnaire consisted of 32 items for CBT students with parallel sections for the non-CBT programmes. Furthermore, a 41-item questionnaire was designed for the lecturers and 18-item interview schedule for polytechnic administrators. The items in the baseline study consisted largely of closed-ended questions where students chose from among alternatives and a few open-ended questions that allowed them to provide their own responses. The responses were developed into coding categories and classified according to the variables in the study, each variable including responses that are similar in content. This process helped in organizing, quantifying and analyzing the data. These techniques sought to explore in-depth ideas on CBT implementation in the polytechnics among the various CBT programmes.

In the follow-up study, a questionnaire containing 63 items was used to elicit views and opinions on the perceived effects of CBT on the teaching and learning process in the polytechnics (See Appendix A). However, 39 of the items were specifically designed and rated on a four-point scale ranging from 4 (fully agree) to 1 (fully disagree) to measure the independent variables. The dependent variable was also measured by nine items on four-point scale ranging from 4 (very effective) to 1 (not at all effective). Each variable contained multiple items and the total scores were considered as dimensions. Table 2.3 shows an overview of the dimensions used in the study. Although the internal consistencies of the dimensions in the baseline study were generally poor, these scales were not used in this study, only the improved items were used. The instruments were reviewed to remove unclear, bias and deficient items while new items were included for the follow-up study. This improved the reliability indices which varied from good (quality of teachers), satisfactory (e.g. teaching and learning modules) to unsatisfactory (involvement of industry). The decision to include the industry in the analysis is due to its crucial role in CBT implementation. However, the outcomes with regard to this dimension have to be viewed with caution.

In view of the poor reliability indices in the baseline study, we did not make any comparisons between the baseline and the follow-up studies. Moreover, the polytechnics in Ghana run different academic calendars with different periods and durations of industrial attachment within each study programme. It was therefore difficult to keep track of the same students who participated in the baseline study at the various locations in the country to facilitate a comparative analysis of the two measurements.

The questionnaires in both studies were organized into six sections. Each of these sections addressed the variables used in the dissertation. They include teaching and learning modules, teaching and learning processes, assessment and grading, internship programme, acquisition of professional skills and overall assessment of the study programme.

2.2.4 Independent variables

2.2.4.1 Teaching and learning modules (modular structure)

Both teaching and learning modules or modular structure were used interchangeably to describe the division of CBT curricula into independent units called modules. The items in the questionnaire that addressed the modular structure were rated on a four-point scale ranging from 4 (fully agree) to 1 (fully disagree). The items aimed at eliciting views and opinions about organization and selection of modules, progression from one module to another, and assessment of learning modules in CBT lessons. The Cronbach's alpha of the 'modular structure' scale improved from a rather poor coefficient of .20 in the baseline study to a satisfactory level of .66 in the follow-up study.

2.2.4.2 Teaching and learning Processes

Teaching and learning processes consisted of 4 items in both studies. The items measured teachers' approaches to lesson delivery and learning culture (student or teacher-centred), self-paced learning, teachers 'support to students learning and students' challenges in the teaching and learning process. Although, the reliability indices in both studies were unsatisfactory, it improved from .22 in the baseline study to .42 in the follow-up study.

2.2.4.3 Assessment and grading

The items in the assessment and grading section were rated on a four-point scale going from 4 (strongly agree) to 1 (strongly disagree) all of which were positively formulated. Items in this variable included the mode and focus of assessment, personnel involved in assessment, awareness of assessment criteria, recognition of prior competencies and procedure for assessing students' prior knowledge and skills. Students were asked to express their opinion on the use of 'competent' or 'not yet competent' in grading students' performances in CBT system. Opinions were sought from students on whether the grading system provides levels of competence, distinguishes between high and low achievers, recognized in higher education institutions, and whether or not it shows students' strengths and weaknesses in the training activities. The internal consistency reliability coefficient of the performance grading factor in the baseline and follow-up studies were .61 and .69 respectively.

2.2.4.4 Internship programme

Internship programme measured students' attachment with industry, organizations and business community. In view of the different periods of internship, placements and experiences, the items were designed in a semi-structured response type where students partly provided their own responses and made choices from multiple options. Information

gathered about students were number of times they undertake internship, the ease with which they obtain placement, relevance of place of attachment to study programmes, quality of mentoring and assessment, students' own assessment on their performance on attachment and challenges faced in the attachment programmes. The reliability index of internship programme improved from .43 in the baseline study to .66 in the follow-up study.

2.2.4.5 Overall assessment of the study programmes

The last section of the questionnaire required students to provide their opinion on the effect of CBT on their study programmes. The section consisted of 18 items, which were rated on four-point scale with scale anchors defined as 4 (fully agree) to 1 (fully disagree). The items covered wide range of issues related to learning modules, quality of teachers, feedback, and industry participation in CBT. The Cronbach's alpha of the subscale for quality of teachers was .79, feedback was .61 and industry involvement in CBT was .44. Although, the alpha coefficient of industry involvement was low, it was included in the analysis in view of the pivotal role of industry in CBT implementation. Unlike the items in the follow-up study which were measured on Likert-scale, items in the baseline study were largely closed- and open-ended questions. Therefore the variables in the baseline used in Table 2.3 are not necessarily the same as used in Table 4.1. For example: 'grading of performance' and 'criteria for assessment' in Table 4.1 have been recoded into 'assessment and grading variable' in Table 2.3. Similarly, 'selection of training and learning modules' and 'progression from one module to another' in Table 4.1 have been recoded into 'mode of teaching and learning' in Table 2.3. Table 2.3 therefore provides only the descriptive statistics and reliability indices of the variables in both baseline and follow-up studies.

Table 2.3 Overview of variables in the study

Variables	No. of items		Mean		Standard Dev		Cronbach's α	
Independent	BL	FU	BL	FU	BL	FU	BL	FU
Modular structure	4	7	2.15	21.03	.77	3.03	.20	.66
Mode of teaching and learning	4	4	1.26	2.27	.82	1.09	.22	.42
Assessment & grading	6	7	3.44	20.99	1.52	3.54	.61	.69
Internship programme	6	7	4.2	9.01	1.15	2.1	.43	.66
Quality of teachers	-	4	-	11.28	-	2.47	-	.79
Feedback	-	6	-	17.22	-	2.99	-	.61
Involvement of industry	4	4	2.88	15.01	.96	2.86	.46	.44
Dependent								
Acquisition of skill & attributes		9		27.80		3.84		.84

BL=Baseline study FU =Follow-up study - = Not applicable

2.2.5 Dependent variable

2.2.5.1 Acquisition of professional skills

The acquisition of professional skills referred to generic or employability skills which formed the dependent variable in the study. These skills form part of the training activities in CBT and believed to be common to, and essential to all occupation (Guthrie, 2009). These skills include creativity, communication, problem-solving, teamwork, adaptability, organizing and analyzing information. The section was assessed by nine items, rated on four-point scale ranging from 4 (very effective) to 1 (not at all effective). The internal consistency reliability coefficient of the items was alpha; .84.

2.3 Data Analysis

In this study, the data were analysed in four phases. Firstly, descriptive statistics (means, standard deviation) were presented for all the independent and dependent variables in the study. Secondly, relevant items in CBT and non-CBT students' data that addressed the variables were merged into one file to facilitate comparison. Similarly, relevant items that appeared in both students' and lecturers' data were also merged together for comparison. An independent sample T-test was conducted on CBT and non-CBT students on one hand, and students and lecturers on the other hand to determine significant differences among the means scores of the variables (see Tables 4.1 and 4.2).

Thirdly, hierarchical regression analysis was conducted to identify whether the independent variables (students' background characteristics, industry training and different study programmes) predict the dependent variable (acquisition of employability skills). In a four stage model, the student background characteristics were tested in the first two models, industry training in the third model and different study programmes in the fourth model (see Table 6.3).

Finally, structural equation modeling (SEM) analysis was conducted to examine possible mediating variables and causal relationships among the variables and to understand comparative strengths of direct and indirect relationships among the independent variables towards the dependent variable (acquisition of skills and attributes) (see Fig. 5.2).

Chapter 3

Competency-based training in international perspective: comparing the implementation processes towards the achievement of employability

Abstract

This article undertakes a comparison of competency-based training (CBT) systems in a number of countries with the purpose of drawing lessons to support Ghana and other countries in the process of CBT implementation. The study focuses on recognition of prior learning and involvement of industry since these features seem crucial in achieving employability. The study shows that industry is involved in the training activities. However, RPL requires innovative techniques such as e-portfolio and on-line facility to provide greater awareness and quality information to assist learners to produce work-related evidence. Performance criteria in RPL assessment must cover situational contexts and contingency management skills to enhance flexibility and adaptable labour force in the event of changes in workplace practices.

This chapter is based on:

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3.1 Introduction

In recent times, factors such as the rapid pace of technological change, the development of a knowledge-based economy and high labour mobility have influenced the need for expansion in post-secondary education and training and the development of life-long learning. New emerging markets require graduates who are able to operate in complex environments characterized by ill-defined problems, contradictory information, dynamic and highly integrated processes (Westera, 2001). This implies that education and training systems need to focus on producing workers who are autonomous and can engage in discretionary learning to support changes in the workplaces (Wheelahan and Moodie, 2011). More specifically, Vocational Education and Training (VET) systems need to emphasize on developing competencies and capabilities rather than qualification.

Developing the capabilities is believed to strengthen the link between VET and the labour market and therefore assist students to acquire employable skills (Biemans et al, 2004). One major teaching and learning approach in the VET systems that is believed to have the capacity to reduce the gap between training and the labour market and achieve employability is competency-based training (CBT). The major reason for CBT reforms stems from the importance both governments and industry attach to the development of competences required in the labour market so as to reduce the unemployment rate, increase productivity and to achieve international competitiveness (Arguelles and Gonczi, 2000).

Moreover, the notion of CBT has become more popular among policy-makers because it is said to fit very well within the policy discourses of employability and lifelong learning. As a result, various competency programmes have been developed by national and international bodies in the VET systems across the globe to ensure that students acquire competencies deemed necessary to be employable. These include the European Qualification Framework (EQF), European Credit System for VET (ECVET) and Programme for International Student Assessment (PISA) by OECD member countries to assist students to acquire key competencies considered essential for effective participation in the labour market (Mulder et al, 2006). Similarly, the International Labour Organisation (ILO) and the UNESCO International Centre for Technical and Vocational Education and Training (UNEVOC) have developed various programmes using the competence-based approaches to support the training of professionals in the Latin America, Africa and Asia (Wesselink et al, 2010).

Several studies on the effect on CBT implementation have been focused on the perspectives of staff development (Lowrie, Smith, and Hill, 1999), an enterprise perspectives (Mulcahy & James, 2000), instructors' perspectives (Lowrie, 1999) and policy makers and training providers (Smith, 1999, 2010). In some of these studies, the effects of CBT on the development of employability potentials of students have been generally focused on competent performance that involves the achievement of knowledge, skills and attitudes without considering new ways of thinking about employability. It is argued that employability must be judged from the point of view of whether the training processes effectively equip students for lifetime learning and develop the self to be able to solve

problems in life and employment (Knight and Yorke, 2003; Van den Heijden, 2005). The training process of CBT is perceived to equip students with competencies needed in their future professions and be able adapt to future developments in their work (Jenewein et al, 2004, cited in Wesselink and Wals, 2011). The paper therefore examines two features of CBT which are linked with the achievement of employability namely; industry participation and recognition of prior learning. Industry participation in CBT is crucial to ensure that training programmes match with the needs of industry so as to reduce skill shortages and unemployment and to improve productivity. Recognition of Prior Learning (RPL) is a form of assessment that provides opportunity for students especially from disadvantaged backgrounds to participate in the VET system to acquire employable skills. RPL is said to promote lifelong learning, a critical strategy for enhancing skill development and addressing skill shortages, and a mechanism for promoting equity and social inclusion (Smith and Clayton, 2009). RPL assessment is linked with industry because it must be conducted in the work environment or in simulated conditions and learners' performances must be measured against the industry competency standards. The study examines whether the implementation of these features goes beyond the achievement of knowledge, skills and attitudes to promote efficacy beliefs and lifelong learning. In this regard, this study compares the implementation of these CBT features in the United Kingdom (UK) and Australia with Ghana with the purpose of drawing some useful lessons for Ghana and other countries with emerging VET institutions.

The main research questions for the study are: To what extent do involvement of industry and recognition of prior learning in CBT implementation help to achieve employability? What lessons can be drawn from these experiences to support CBT implementation in Ghana?

3.1.1 Contextual factors for CBT reforms in Australia, UK and Ghana

Although Australia, UK and Ghana differ in their socio-economic structure and geographical location, these countries were selected because of the similarities in method of implementation and their behaviouristic stance adopted towards CBT (Mulcahy and James, 2000, Biemans et al, 2004)**.** In all these countries, the implementation of CBT forms a crucial part of the national reform agenda, which were triggered by government reports such as the Manpower Services Commission (MSC, 1981) in the UK, Fynn, Carmichael and Meyer reports of 1993 in Australia and COTVET (2006) in Ghana. Besides, there is a central government that is actively involved in developing and implementing CBT. In each case, government intervention engaged industry and business partners, organised labour and trade unions in the development of apprenticeship systems, qualification frameworks and funding mechanisms. In all cases, the reforms emphasised training system and transformation of the Further Education sector with particular focus on the development of intermediate or higher level vocational qualifications. Finally, both UK and Australia have great wealth of experiences and literature on CBT implementation because of their pioneering role in developing competency-based approach in VET (Winterton, et al, 2005).

The main reasons for the reform in the countries under review can be traced to government sources, economic conditions, educational sources and trade union movement. Political concerns about poor economic performance, rising unemployment as well as growing skill gaps particularly among the young people in the VET systems resulted in several national investigations and reports from the government in the early 1980s; significant among them in Australia were the Finn, Carmichael and Mayer Reports (Bowden and Masters, 1993) and the Manpower Services Commission's consultation document, a New Training Initiative (MSC, 1981) in the UK. Both reports emphasised the development of occupational competencies to achieve flexible and skilled workforce that could participate effectively in the emerging forms of work and global economic changes (Swalies and Roodhouse, 2004).

The recessionary condition in UK in the 1980s (Matlay, 1999) and the technological revolution in Australia in the mid 1980s (Cornford, 2001) are economic contexts for the CBT reforms. In the UK, many young people were dropping out of education and training without sufficient vocational qualification to enter the labour market. The percentage of the UK's workforce who had no post-compulsory secondary qualification slightly decreased from 64.4% in 1976 to 62.2 % in 1987. Similarly, percentage of the workforce with intermediate vocational qualification within the same period decreased from 30% in 1976 to 26.3% in 1987 (Foot and Megginson, 1996). As a result, the National Council for Vocational Qualifications (NCVQ) was established to develop competences through VET and to recognise all vocational qualifications to assist greater labour mobility (Keep, 2000, Boreham, 2002). In Australia, the Structural Efficiency Principle (SEP) initiated by the Trade Union Movement particularly emphasised on skill training, careers, job classification, pay rates and equity to achieve increased productivity. These and many others set in motions a process known as the National Training Reform Agenda in Australia with CBT as its focal point.

On the educational front, the UK had a rigid system of education and training, a theory-based curriculum and certification was based on the outcome of a single examination. The existing programme for the youth had no certification system for trainees, leaving employers sceptical about the potentials of employees about the depth, range and quality of their training. Similarly, the technological revolution in Australia in the mid 1980's resulted in eliminating a large number of the repetitions and laborious jobs which were available in many industries especially for the lower-skilled and school drop-outs (Keating, 2008). New jobs created with the new technology required higher and broader levels of education and skill formation

Like the UK, Ghana's VET system was theory-based and relied mainly on paper and pencil examinations for certification and employment (COTVET, 2006).A report by the Technical Committee on Polytechnic Education (2001) also showed that the Examining Body for the Polytechnic Education in Ghana lacked the appropriate schemes for the assessment of skills, competencies, aptitudes and practical training in HND examinations. The socio-economic

factors relate to difficulty in getting job placement for the polytechnic graduates in the labour market as a result of inadequate employable skills. In a study of the labour market performance of tertiary graduates including the polytechnics, employers revealed that most of the graduates lacked basic skills to complete simple routine assignment (Boateng and Sarpong, 2002). A tracer study on the performance of polytechnic graduates in the Ghanaian labour market by Boahin, Kamphorst and Hofman (2010) revealed that almost half of the graduates (43.8%) undertook professional training to either improve their job skills and knowledge or learn new skills to overcome deficiencies in their skill training.

Moreover, there was a perceived weak linkage between training institution and industry leading to inefficient schemes of industrial attachment and apprenticeship training (JICA, 2008; Boahin and Hofman, 2012. Given these realities, CBT was introduced to improve the quality and relevance of Technical and Vocational Education and Training (TVET) by equipping graduates with the required workplace and professional skills, promote a stronger working relationship with industry, reduce graduate unemployment and to achieve international competitiveness (NFP-NPT, Newsletter, 2005, COTVET, 2006). In Ghana, most of the institutions in the TVET systems and higher education continue to change their educational concepts by designing and redesigning teaching and learning processes towards competency-based education.

3.1.2 Competency-based training and the concept of employability

The concept of competence has its roots from the organisational learning and development where competence was used to describe human behaviours that were necessary to attain high job performance (Sandberg, 2000). However, different organisations and countries have different meanings to the concept of competence based on their institutional structures and labour processes. In the UK and Australia, the term is used to indicate the range of standards for occupational performance or profession. As such, the notion of competence in both systems reflects the expectation of employers and analysis of job functions in the workplace (Smith, 2010). In the UK's VET system in particular, competence denotes narrower skills, not underpinned by substantial knowledge and usually defined by outputs (Wesselink et al, 2010). For this reason, the National Vocational Qualifications (NVQs) are outcome-based and relate to the behaviouristic approach to competence (Mulder et al 2006, Wesselink et al 2010). In the United States of America (USA), competency is defined as the underlying characteristics that enable an individual to achieve exceptional performance (McGuire and Garavan, 2001, Dubois and Rothwell, 2004). This implies that competence approach in the USA emphasises much more on potential and cognitive perspectives of learning rather than demonstrated proficiency. The European perspectives on competence tend to be holistic that includes underlying characteristics and attitudes of an individual to perform specific tasks and roles to expected standards in a given context (Mulder et al, 2006). In this sense, competence is defined in the context of functional, personal or behavioural, cognitive and ethical components (Biemans et al, 2004).In Ghana, competence is conceptualised as the capacity of an individual to perform professional tasks to a specified standard (COTVET, 2006). In the light of these diverse viewpoints, Hofmann (1999) identifies three constituents

in the term competency, namely; observable performance; which focuses on the ability to complete a task, standards; which relates to the quality of observable performance, and underlying attributes; that includes the required underpinning knowledge, skills and attributes that can be adapted to workplace changes and social requirement. It can be deduced from the forgoing that CBT is a delivery of training that develops the skills, knowledge, attitudes and values required to perform professional tasks after the learner has completed a training programme or module. It also implies that CBT has the potential to influence the ways in which employment-related skills are developed and assessed in the training programme.

As an evolving concept, recent developments into the concept of competence and for that matter CBT tend to integrate many issues in contemporary education. Some of these include self-managed learning, the integration of theory and practice through industry and VET linkages, recognition of prior learning (RPL), authentic assessment and social constructivism (Mulder et al, 2006). The integration of these innovations in CBT aim at increasing access, encouraging self-beliefs, problem-solving strategies, capacity for self-regulation and life-time learning among students. This study however, examines RPL implementation and involvement of industry in the context of CBT towards the achievement of employability. The concept of employability can be defined from the perspectives of the society, employer or company and individuals (Mason et al, 2006, Thijssen et al, 2008). In the views of Reid and Fitzgerald (2011) employability is about being capable and able, and learning how to learn to be able to meet future challenges in a work situation. Bagshaw (1997) offers a dynamic view of employability which is not linked to possession of skills and competencies to survive in a work situation, but requires flexibility and adaptability to be able to seek alternative employment in a changing world.

In this sense, individuals who are employable must be capable of setting goals and priorities, be proactive in management of change, possess necessary skills for self-advocacy and networking to cope with changing circumstances, be active in the maintenance of continuous learning and capable of working within changing teams (Bagshaw, 1997, Glover et al, 2002). Harvey's (2001) views on employability shift the focus from individual student to get employment to an institutional achievement. Yorke (2007) perceives employability as multi-faceted characteristics of an individual to gain employment and be successful in the chosen occupations. The understanding of employability is further linked with 'job mastery' and its relationship with the qualities of the study programme, on-the job training and working environment (Aamodt and Havnes, 2008). It is evident that, employability is an extremely complex and vague concept that is difficult to articulate and define. However, by synthesizing the available literature, employability is seen as a combination of factors that enable people to increase their chances of getting a job, staying in and progressing further in the workplace. However, research on current employability often focuses on predictors or characteristics such as dispositional (e.g. self-efficacy), ascriptive (e.g. age) and experience (educational background) (Van den Heijden, 2005, Thijssen et al 2008). Linking

employability with the training curriculum, Knight and Yorke (2003) present the USEM model as four broad and interrelated components that influence employability. They are (a) Understanding of disciplinary subject-matter, (b) Skilful practice in context (academic, employment and life in general), (c) Efficacy beliefs that denotes the degree to which learners believe that they are able to demonstrate behaviour that will result in achieving their goals and (d) Meta-cognition that also reflects the notion of self-awareness, learning how to learn and capacity for self-regulation. This framework suggests that the notion of employability is not limited to the development of flexible skills but also self-awareness, understanding and personal attributes for lifetime learning. These qualities are very important because in the context of rapid global economies, professionals need graduates who can grow and keep pace with changes in operations and demands in the contemporary work places. In this respect, the main focus of this study is to explore how employability is achieved in the CBT programmes by focusing on competence, students' efficacy and lifelong learning.

3.2 Method

The review on this study was based on relevant literature and policy papers from several databases including Academic Search Elite, Science Direct, Educational Resources Information Centre (ERIC) and Web of Science in order to explore the CBT implementation among the countries under review. The search on the databases was conducted using combination of keywords such as competence, employability, implementation, assessment, recognition, and accreditation with the following descriptors; industry-based training, apprenticeship training, prior learning, competence-based training and lifelong learning. The research involved three main analyses, namely; contextual, content and comparative. Contextual analysis was used to explore some relevant similarities and differences in the educational, economic and social contexts that influenced the CBT reforms in the three countries being studied. It also examined the role of government interventions, involvement of industry and trade unions, barriers to access, progression and pathways to vocational qualification. Using the content analysis, relevant scholarly literature and policy documents were thoroughly examined to obtain insights into the underlying philosophies of country-specific CBT and RPL policies, practices and outcomes, industry involvement and assessment practices and their eventual effects on the achievement of employability. Finally, comparative analysis was conducted to determine the similarities and differences in the implementation processes and the extent to which each of the features assisted students towards the achievement of employability. The comparative framework for the analysis included (a) the implementation of RPL, (b) industry involvement and (c) assessment practices of RPL towards the achievement of employability. These features were critically analysed on the following criteria (a) achievement of competence (b) development of efficacy beliefs and (c) promotion of lifelong learning. The outcome of the analysis was used to generate conclusions to support the implementation of CBT in Ghana.

3.3 Implementation processes of RPL and industry involvement among the countries

3.3.1 Recognition of prior learning (RPL)

The process of giving official acknowledgement to formal, informal and non-formal prior learning is commonly labeled as assessment, accreditation or recognition of prior learning APL or RPL. The concept of RPL is defined differently among countries due to differences in the usage and implementation strategies. In Australia, New Zealand and South Africa, the term RPL is used while in the UK, the accepted term is Accreditation of Prior (Experiential) Learning (APEL). In the USA and Canada, it is Prior Learning Assessment (PLA), although Accreditation of Prior Learning is sometimes used in Canada. In spite of the slight differences in terminologies and definitions, the main goal of RPL is to recognise and acknowledge individuals' competence and knowledge regardless of how and where it has been acquired (Freitag, 2007; Stenlund, 2010). It also provides diverse and inclusive pathways to learning especially for students from disadvantaged backgrounds and to promote life-long learning (Stenlund, 2010). The notion of RPL is based on the assumption that learning from experience can be made equivalent to academic learning (Shalem and Streinberg, 2006). The concept of RPL is derived from the experiential learning and adult education theories. While the experiential learning views experience as a transformational process that leads to learning (Taylor and Clemans, 2000), the adult education theory believes that adult learners can succeed in higher education as a result of their previous life experience (Harris, 2000).

Underpinning to the concept of RPL is the notion of lifelong learning. Lifelong learning is an active, on-going, voluntary and self-motivated pursuit of knowledge and skills to develop the self to be able to solve problems in life and employment. Lifelong learning is said to promote employability, economic competitiveness, mobility and individual fulfilment (Colardyn and Bjornåvold, 2004 cited in Stenlund, 2010).

The implementation and utilization of RPL and APEL in Australia and UK respectively are offered on national basis and involves national lead agencies such assessors, advisors, and verifiers who initiates coordinate and promote RPL development through the provision of adequate information, assessment procedures, economic support and quality assurances (Knight, 2006; Starsz, 2011). The RPL process is usually based on modularisation of study programmes on the basis of specified learning outcomes. It involves learners presenting a portfolio of work or collection of evidence supported by verbal or narrative argument (Lester, 2007). Sources and types of evidence include copies of pay slips, resumes, performance appraisal, logbook entries, achievement records, training records, papers and photograph, samples of completed work, references from current and past employers, supervisors and colleagues, certificates, testimonials from clients and work samples. These collections are evaluated to ensure whether the evidence can be accepted as credit, be counted towards qualification, or determine readiness for admission to a programme or specific course (Joosten-Ten Brinke et al, 2008, Lordly, 2007). The evaluation process includes document analysis, authentic and knowledge tests involving written, oral and

computer-based test or demonstration of practical skills. In the UK, other criteria for evaluating evidence for APEL include acceptability, sufficiency, authenticity and currency (Garnett et al, 2004). Assessment process of RPL/APEL is subject to the same rigour as competence which depends on the student's performance of narrow set of skills prescribed by the employer in the workplace (Brockmann et al, 2008). Learning outcomes are measured in terms of 'competent' or 'not yet competent' as in Australia and 'pass / fail' in the UK because the outcome of learning is specified in a single performance criterion which can either be demonstrated or not.

Blom et al (2004) found that employees who accessed RPL in an enterprise-based training enhanced employment prospects of learners, identified skill gaps and opportunities for networking with other learners and staff within training organisation. It is further reported that students who undergo RPL process exhibit greater self-confidence, improved self-esteem, problem-solving skills, self-awareness and higher motivation to continue with their studies (LeGrow et al, 2002; Whittaker, Whittaker and Clearly, 2006). Some of these potential benefits of RPL however, must be treated with caution since much of the literature is often prescriptive or descriptive and the claims lack rigorous methodology and analysis (Joosten-Ten Brinke et al, 2008; Smith and Clayton, 2009).

Bateman and Knight (2002) report that the use of RPL in Australia is greatest among older VET students (25-39), probably due the fact that older students are more able to compose their portfolios compared to the younger ones. It is reported that in 2004, proportion of students with at least one RPL subject was 10% for Diploma and above students, 5.5% for certificate III & IV and 1.8% for Certificates I & II students. In terms of age group, students with RPL for age (25-39years) were 4.4%, (20-24years) were 4.2% and 2.1% for (15-19years) (Knight, 2006). This contrasts with the UK system where award of NVQ on the basis of APEL is much higher at levels 1 to 3 (Certificates levels) than 4 to 8 (Diploma and Degree levels) because of low theoretical content at the lower levels. This adversely affects progression between different NVQ levels and from vocational to academic route (Garnett et al, 2004, Clarke and Winch, 2006). Despite the perceived advantages of access and equity, RPL implementation as a route to qualification in both Australia and UK has not achieved much success. As a result, the number of students gaining APEL annually in higher institutions was relatively low (Irving, 2002). Similarly, students who received RPL in the university in Australia slightly increased from 4.2% to 5.2% and in the VET system from 6.8% to 7.3% between 1997 and 2001 (Wheelahan et al, 2002). Other challenges include high cost of implementation, labour and resource intensive, and applicants' difficulty in writing portfolios. The poor perception about the effectiveness of RPL has resulted to a problem of mutual recognition of qualifications among universities, VET colleges and related fields of study, forcing applicants to undertake extra training on skills they have previously acquired (Wheelahan et al, 2002; Misko, 2006; Stenlund, 2010).

In Ghana, RPL is not officially known in the CBT implementation. Many skills acquired informally through self-learning or apprenticeship are not recognised (Palmer, 2009). For

example, about 60% of the junior High school leavers (JHS) and a further 30% of Senior High School (SHS) leavers who could not proceed to SHS and tertiary education respectively engage in training provided by master craftsmen in various trades (Doudu, 2006,). However, most of the skills acquired by these trainees through training are not recognised. Moreover, there is no well-defined progression or training pathways within the whole VET system in Ghana, making it difficult for these trainees in the informal sector to obtain opportunities for higher levels of qualification. It is reported that only 1.6% of the total educated labour force in Ghana has some qualification in vocational and technical education (Baffour–Awuah and Thompson, 2011). Given these realities, there is the need for qualification framework which recognises individual's prior learning from a variety of contexts to enable trainees in the informal sector acquire higher levels of vocational qualification.

3.3.2 Industry involvement in CBT implementation

One of the crucial aspects of CBT is to match training to the needs of industry. This implies that the competencies acquired in the training programme must correspond to the demands of the jobs, occupations and working conditions. Furthermore, the underpinning ethics, values, and moral standards should match with the profession. This section discusses the involvement of industry in CBT implementation in the development of competency standards and apprenticeship training.

3.3.2.1 Development of competency / occupational standard

One of the major roles of industry in CBT implementation among the countries under review was the development of occupational profiles, required competencies in each occupation, and criteria for performance standards. These standards formed the starting point that was translated into curriculum, delivery and assessment of the CBT system (Ducker, 1993). VET institutions geared their courses and training programmes to assisting individuals to achieve the standards. Industry-led agencies such as the Industry Skills Councils (ISC) in Australia, and Sector Skills Councils (SSC) in the UK formed networks with various Industry Training Advisory Boards (ITABS) to identify critical work functions, key activities, performance standards, skills and knowledge required to successfully perform a given occupation or field (Dept of Education and Labour, 2003).

In UK, the National Training Organisations (NTOs) develop occupational standards and accredit skills required in the workplace. Competences are developed from analysis of job roles with little or no underpinning knowledge, which in turn are grouped into competence to make particular NVQs. These standards are developed into modules by award bodies within the framework of the qualification authority (Keating et al, 2002). This is similar to Australian system, where standards are developed by the National Training Board (NTB) and then used to develop modules accredited by State Training Recognition Authorities. For instance, between 1992 and 2004, there were 23 national ITABS and 136 associated state or territory bodies that worked with employers to develop competency standards and provide

information to the government on industry trends and future skill needs and training requirements (Sung et al, 2006).

Industry also provides quality assurance in the form of accrediting programmes, monitoring and evaluation against the national standards. . The Australian Quality Training Framework (AQTF) ensures delivery of accredited training and qualifications, quality standards relating to record keeping, qualification of teachers and trainers, use of marketing mechanisms, teaching and assessment processes, recognition of prior learning and mutual recognition of qualifications (Misko, 2006).
In the UK, large teams of external verifiers approve centres for training and assessment of NVQ's and carry out inspection or verification visits to these centres at least once a year (Purcell, 2001).
Quality assurance in Ghana is undertaken by the National council for Tertiary Education (NCTE), National Accreditation Board (NAB), National Board for Professional and Technician Examinations (NABPTEX) and COTVET. These supervisory bodies accredit curriculum and programmes, monitor and evaluate assessment practices and advise government on general policy direction for TVET and higher education. Industry Training Advisory Committees (ITACs) are being established to establish links with industry, offer periodic review of the curricula, identify critical work functions, performance standards and required competencies for successful performance in a given occupation (COTVET, 2006). However a baseline survey on CBT implementation on TVET showed weak linkage between theory and practice, which was attributed to non-involvement of industry in the TVET study programmes (JICA, 2008).

3.3.2.2 Apprenticeship training

Apprenticeship training provides work-based training in a broad range of sectors to individuals to learn new skills and gain recognised qualification to achieve employability. It is a mixture of work-based training and education which includes occupationally-specific qualifications, generic or key skills and underpinning knowledge. Apprenticeship is organised for different age groups of trainees for different levels of qualification. In Australia, contracts for shorter duration usually less than two years are referred to traineeship whiles apprenticeships are used for longer durations (Cuddy and Leney, 2005, Misko, 2006). This arrangement does not only help students in the VET systems but also secondary school students to undertake part-time school-based apprenticeships and traineeship programmes while completing their education (Robbinson and Misko, 2003). In 2005, about 389,000 trainees, accounting for a quarter of the VET enrolment in Australia were found in apprenticeship or traineeship (NCVER, 2007).

In the UK, the Modern Apprenticeship offers training leading to NVQ level 3 or higher while the New Deal offers the young people who have been unemployed for six months or more the opportunity to train for NVQ or other approved vocational qualifications. Furthermore, 14-16 years old undertake young apprenticeship, 16-25 for pre-apprenticeship and over 25 years old enrolled in apprenticeship although the completion rate was low. Out of 270,000

young apprentices of the 14-19 year group who engaged in apprenticeship training, only 40% of them completed (Sung et al, 2006).

Apprenticeship training in the UK has constituent elements including underpinning knowledge (Technical certificate), functional skills (key skills) and NVQs (work-based assessment). Although useful and appear to be holistic, the system is criticised for lack of integration. Moreover apprenticeship in the NVQ basically focuses on level 2 qualifications which require low theoretical content for routine and low-skilled jobs rather than providing comprehensive and broadly-based VET to young people (Nuffield Review, 2008, Brockmann et al, 2008). Some apprenticeship in the UK is further criticised because acquisition of NVQs are also linked with funds and not about ensuring social and occupational mobility. In Ghana however, the large number of medium and small scale industries characterised with inadequate technical and infrastructural facilities limits formal apprenticeship training to students on internship while informal apprenticeship is provided by master craftsmen in various trades. Practical internship programmes form a crucial segment of CBT in the VET system to ensure industry-relevant training. It is the period where students have the opportunity to spend about six months in a workplace or related institutions, industry or organisation to learn on the job. Both training institutions and industry collaborate to ensure students' placement, supervision and assessment. However, internship programmes in the training institutions are not well-structured, leading to poor supervision and mentorship, while students' placements do not often relate to their study programmes (Boahin and Hofman, 2012).

3.4 Discussion and Conclusion

We examined the experiences in the implementation of CBT in a number of countries with a particular focus on recognising prior learning and involvement of industry. In this section we discuss the lessons learnt to support CBT implementation in Ghana.

3.4.1 Achieving employability through RPL

From the study, students who undergo RPL process are said to exhibit greater self-confidence, improved self-esteem, self-awareness and higher motivation to continue with their studies (Whittaker, Whittaker, and Clearly, 2006). As the process of RPL encourages learners to continue educating themselves and upgrading their skills and knowledge for improved employment outcomes in itself is considered to be part of lifelong learning (Smith and Clayton, 2009, Stenlund, 2010). This assists individuals to gain a feeling of self-worth and confidence to make changes in their lives and career directions. However, both the NVQ system and the training packages in the UK and Australia respectively focused on assessment of task-specific skills deemed necessary for certain job roles that required little or no underpinning knowledge. As such, these systems neither enhanced the production of innovative knowledge nor lifelong learning and individual social and occupational mobility (Brockmann et al, 2008). Moreover, low theoretical content also tend to inhibit progression between different levels of NVQs and from vocational to academic routes (Garnett et al, 2004, Clarke and Winch, 2006). The issue of pre-defining outcomes against specific

standards tends to restrict the assessors' judgement to routine practices in the workplace which may not guarantee employability. Moreover, when outcomes of learning are tied to descriptions of work or specific workplace activity it emphasises tradition and discourage the development of innovative knowledge and new forms of practice, leaving graduates for largely routine and restricted tasks (Nuffield Review, 2008).

For RPL assessment to enhance employability, performance indicators must cover both routine and non-routine workplace practices, situational contexts and contingency management skills in order to promote flexibility and adaptable labour force to deal with the unknown (Reid and Fitzgerald, 2011). Furthermore, the assessment processes of RPL must not only assess the technical aspect of the subject but must also develop the self. In this regard, feedback from assessment must focus on task-oriented information and corrective advice to build students' self-esteem to self-regulate their learning towards the achievement of learning goals.

Applicants' inability to organise and articulate their own prior competencies suggest that applicants require organisational and reflective skills which are essential to support personal and professional development (Jenewein et al, 2004, Stenlund, 2010). The implication is that both teachers and trainers require high level educational skills and qualifications to support learners in portfolio development towards the promotion of the skills of critical reflection and articulation of their prior experiences. Innovative techniques such as the e-portfolio (Desai, 2006) and an on-line facility to offer quality information on RPL for both students and staff could promote greater awareness, reduce bulky physical products and documents, minimise the time-consuming and onerous tasks of the assessment process and serve as a quality control as it monitors the verification process.

For Ghana to achieve a large stock of human capital for its economic development, RPL needs to be an integral part of the TVET sector to provide access to learning pathways for the large number of JHS and SHS leavers without qualification as well as those engaged in training in various trades. To this end, RPL could be organised in a modular approach in the VET system to assist applicants to obtain a qualification after completion of the module. Although modularisation of courses has the potential to fragment units of knowledge, applicants need to be taught learning–to-learn strategies to be able to establish links between previous and current modules for effective workplace practices and lifelong learning.

3.4.2 Enhancing employability through the involvement of industry

There is considerable evidence of a close cooperation between training institutions and industry in the CBT implementation process to ensure that training and competencies are relevant to job requirements. The role of industry-led sector agencies that work with employers to develop, maintain and update competency standards assist individuals to adapt to current and future patterns of operations in the industry (Waterhouse and Virgonia, 2004). Training on the job in the form of apprenticeships promotes students' employability as it emphasises interaction of individual attributes, team work, learning how to learn, problem-

solving, creative thinking and transfer of professional skills to new contexts (Yorke, 2003, Reid and Fitzgerald, 2011). It also promotes a kind of training that assists trainees to move away from adaptive expertise that emphasises competencies for handling routine tasks to developmental expertise that encourages problem-solving and creative thinking. However, units of competency in Australia and UK were tied to fragmented and narrowly-defined tasks and roles in the workplace with minimal underpinning knowledge base. The specification of skills for specific tasks does not encourage coherent knowledge base for flexible workforce capable of dealing with change (Brockmann et al, 2008).

Apprenticeship training in the UK and Australia were oriented towards routine, task-specific and functional skills at the workplace to meet the short-term interest of employers instead of long-term needs of employees. The low theoretical content in the training system reduces apprenticeship to lower levels of qualifications (level 2) which limits progression between different qualification levels and promotes functional employability for low-skilled employment (Garnett et al, 2004). Such models of apprenticeships reflect narrow specialism at the expense of a broader vocational education and training of the young people for effective functioning both as employees and in the wider society (Clarke and Winch, 2006). This tends to impede the development of innovative knowledge, lifelong learning and social mobility among individuals in a changing labour market. Provision of relevant activities, opportunities, resources in an authentic or simulated environments rather encourage learners to develop adult learning principles such as responsible learning (taking ownership of the learning process), experiential learning ('learning to do' and 'learning from doing'), cooperative learning (sharing learning tasks and learn from a wide range of people), and reflective learning (developing critical thinking and appraising learning experiences to turn into lessons for the future) (Gulikers, 2006, Cleary et al, 2006).

The acquisition of NVQs through funding has further undermined the apprenticeship system in the UK to the extent that education and training are no longer linked directly to the VET programme but reduced to work experience or to meet specific targets required by employers (Brockmann et al, 2008).

The goal of achieving self-belief and the capacity for self-regulation and lifelong learning however, may be difficult to achieve in the face of large number of small scale industries in Ghana. However, innovative partnership between industry and training institutions such as a 'combined school factory' could bring out mutual benefits, including adequate equipment and training facilities, specialised expertise, workplace training, smooth transition of students from school to work and increased production.

3.4.3 Policy issues towards CBT implementation in Ghana

From the review, the following issues appear as key policy and operational guidelines to support CBT implementation in Ghana. They relate to government and stakeholders support

for RPL and CBT in general, holistic apprenticeship system and effective collaboration between industry and training institutions.
Both UK and Australia models of RPL are characterised by involvement of interested parties such as government agencies, assessors, advisors, verifiers, employers and professional associations who are actively involved not only in policy making but also in the delivery of RPL in particular and CBT in general. This means that, leadership, funding, quality assurance; oversight and accountability of RPL initiatives are undertaken by the larger community instead of an educational institution. This radically improves how RPL is perceived, organised and practised while funding becomes a shared responsibility among the interested parties.

Implementation of RPL and CBT in general is said to be labour and resource-intensive which demands trained assessors and providers, researchers and practitioners who can network and support each other, undertake research and disseminate good practices of RPL models to assure all stakeholders of reliable and credible outcomes. Staff development policies must form an integral part of CBT programmes to promote an appropriate and harmonised RPL systems, procedures and standardised assessment tools.

For RPL to provide inclusive pathways for VET qualifications, it must be positioned within the admission requirements of Ghanaian VET system as practised in UK and Australia. This would provide equal access and opportunities for many skills acquired in various trades through self-learning and apprenticeships, thereby assisting the government's skill development policy of upgrading skills and knowledge acquired informally as well as development of life-long learning among the existing workers. Apprenticeship system and competence development in general need to focus on developing the labour with innovative knowledge for social mobility in the changing organisation of work. This means that the training system must be integrated with personal, social and technical competencies with strong theoretical content to enhance progression between levels of qualification. Such integration remains elusive in the UK qualification system and apprenticeship programmes because competence is defined by the output of labour rather than developing labour potential.

More crucially, government, industry and social partners in Ghana need to consider CBT as both economic and social investment in the VET system. Therefore, it is imperative for all stakeholders to forge closer collaboration to achieve the objective of developing human capital to meet the changing needs in the contemporary workplace as well as pressures of employability.
The nexus between skill training and employability however, is a contested issue. Research shows that acquisition of skills does not always guarantee actual employment (Sanguinetti, 2004). Studies show that workers are in jobs that do not require their level of education, qualification or skills whiles most VET systems are not closely linked to occupation or employment (Wheelahan and Moodie, 2011). Mismatch between qualifications and jobs or employment may not always be the result of technological or structural change but may

persist with many workers for several years. The link between skills for employability can be strengthened in the VET systems when vocational training is designed in a more holistic rather than task-focused and emphasise the knowledge base of practice to give students a greater understanding of their broad occupational field.

Chapter 4

Implementation of innovations in higher education: the case of competency-based training in Ghana

Abstract

A notable trend in recent years has been the introduction of Competency-Based Training (CBT) in Vocational Education and Training (VET) systems in many countries. Several CBT training programmes in Ghana have been accredited and quality assured. This article explores the perception of both students and lecturers towards CBT and examines factors that affect its implementation in Ghanaian Polytechnics. It was revealed that industry and polytechnics themselves have not significantly influenced the implementation of CBT. As a result, few CBT features have been adopted in the programmes making the current practice of CBT in the polytechnics lag behind the policy standards.

This chapter is based on:

Boahin, P., & Hofman, W.H.A (2012). Implementation of innovations in higher education: the case of competency-based training in Ghana. *Innovations in Education Teaching International,* 49 (3), 313-323.

4.1 Introduction

In recent times, many attempts have been made to implement new ideas, methods and processes in higher education institutions aimed at meeting the needs of learners, lecturers, industry and national policy. These innovations basically focus on new teaching methods that would change a teacher to become learning manager, facilitator or coach so that students themselves can acquire relevant knowledge and skills to enhance their performances in the wider world of work and their community (Mitchel, 2003). Though, the era of science and technology requires skilled labour force to man the machinery in the industry, employers need more than utilisation of the new technologies. Rather, employees are expected to do the kind of work that the machines cannot perform. Such skills include adaptability, creativeness and human relationship (Bertrand, 1998).

The pressure for change in teaching and learning in the VET and indeed, the polytechnics, has become even more necessary due to the following reasons:

- VET is driven by multiple factors such as global economics, industry restructuring and policy initiatives from the government.
- The world of work keeps on changing due to changes in science and technology leading to changes in tastes and preferences which necessitate a continual adaptation in VET teaching and learning.
- Workplace training demands on VET are as many as there are enterprises, thereby creating new and additional roles for VET teachers (OECD, 2000, Curtain, 2004).

As a result of this on-going change, it is imperative to adopt the teaching and learning patterns that seek to identify and develop key competences and relevant future skills to meet the needs of the labour market. One of such teaching and learning approaches particularly in the VET system is competency-based training (CBT). In Ghana, like other countries, the introduction of CBT into the polytechnics aimed at bridging the skill deficiencies or gaps between study programmes and industry. This study is a formative evaluation to assess the extent to which the polytechnics are adapting their educational practices in the context of CBT. Essentially, the study sought to investigate factors such as industry and institution linkage, use of modular structure, assessment practices, lesson delivery and performance grading and their effects on CBT implementation. It also examined the international experiences in the implementation of CBT. Finally, the paper highlights some of the concerns arising from CBT implementation, lessons learnt and suggestions for improving skill development in the VET.

4.1.1 The concept and features of competency-based training

CBT is an approach to VET that focuses primarily on what a person can actually do in the workplace as a result of completing a programme of training. CBT programmes consist of modules broken into segments usually called learning outcomes. These learning outcomes are based on standards set by industry, and assessment is designed to ensure each student has achieved all the outcomes (skills, knowledge and attitudes) required by each module. Preparation of these modules is carried out by both learners and lecturers in the sense that

the learner-centred approach in CBT requires that learning materials need to suit the needs of learners. Assessment of modules usually occurs at a workshop and workplace or in a simulated environment. Students' progression within CBT programme is not based on time. As soon as students have achieved or demonstrated the required outcomes in a module, they can begin a new module. This helps students to complete CBT programmes much faster than the cohort-based programmes. In CBT, assessment is geared towards specific standards in the industry and not against the achievement of other individuals in a group. In this regard, performance of students is not graded because the outcome of the training is specified in a single performance criterion which can either be demonstrated as competent (pass) or not yet competent (fail).

Recognition of prior learning (RPL) is another feature of CBT. The RPL enables trainees who possess special skills through previous formal training, work or life experience to be assessed as competent in these areas and subsequently exempted from future training in those specific competencies. Industry involves in the training programme through the design of competency standards, curriculum development, project assessment, and apprenticeship training. In short, CBT allows for more equitable matching of education and training with on-the- job needs (Cremers, Eggink & Hoetink, 2005).

A significant feature of CBT is that the role of the VET teacher changes from the traditional way of transmitting knowledge to become facilitator, skill demonstrator and evaluator (Hobart & Lundberg, 1995 cited in Smith & Lowrie, 1998, Eggink & Werf, 2006). The facilitative role of the teacher is based on the assumption that training is focused on the outcome of training and this must be made known to the students before the beginning of the training programme. As students become aware of the required learning outcomes, they are likely to learn on their own whiles the teacher provides feedback to shape their learning experiences towards the attainment of the goal.

Theoretically, CBT can be traced from two main perspectives; the behaviouristic and the holistic. The behaviourist defines CBT in terms of what the individual can do to the neglect of the underpinning knowledge, values, attributes and ethical issues (Gonczi, 1996). The holistic approach rather views CBT in a broader context and integrates personal aptitudes, ethical and cultural values in the training programme. It must be emphasised that the needs of a constantly changing industrial society can never be met by narrow skills training which neglects aspects of general education. The main goal of education is to prepare an individual for life, which involves a multiple of roles in order to function effectively in one's community. Moreover, if CBT is viewed from the behaviouristic perspective, some human and community services are likely to overlook some values and ethical standards that underpin certain professions. For CBT to be effective therefore, requires both generic and occupationally-specific competencies to be linked effectively to a produce fully functioning workforce.

4.1.2 CBT implementation issues

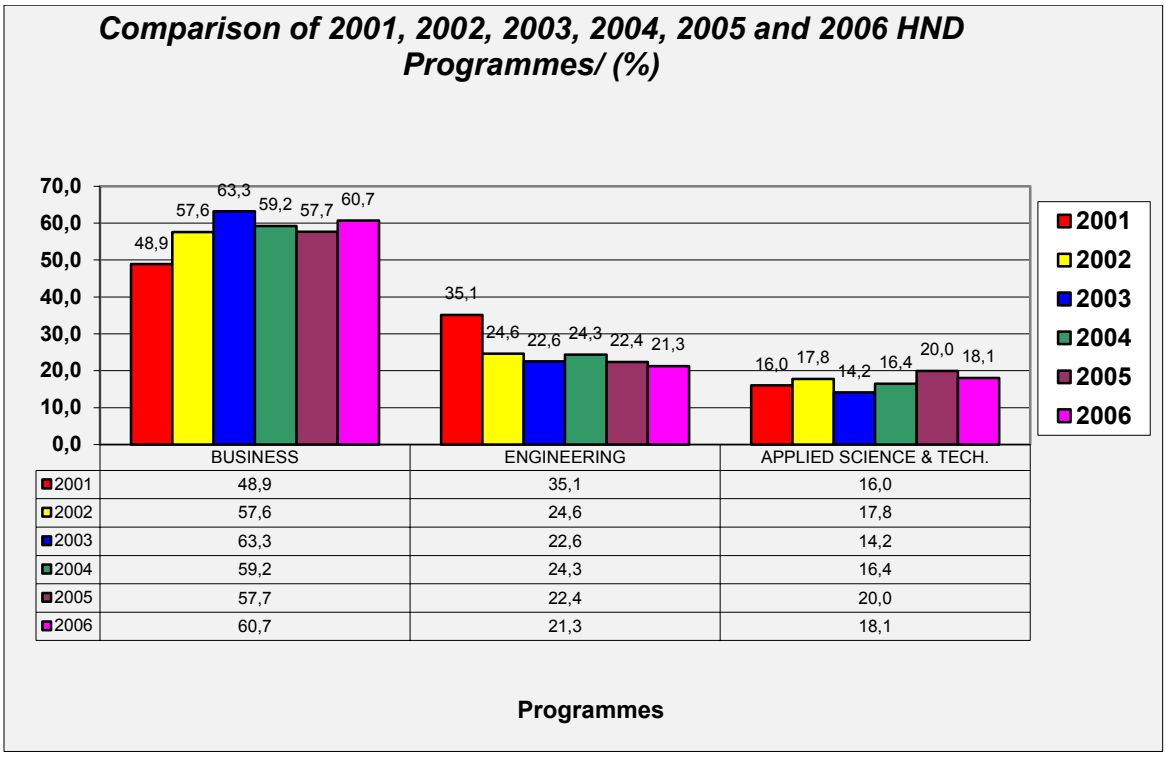
The introduction of CBT in the VET system of many countries has been controversial as many authors and researchers have different views about this learning innovation. In countries such as Australia, United States, Britain, The Netherlands among others, their main criticisms can be summarised as follows; lack of consensus on conceptual definitions for competence, training is too behaviouristic and narrowly-focused on skills, inadequate resources, low motivation among students to learn on their own, lack of career guidance system and inadequate professional and staff development (Sullivan, 1995, Mulder, 2004). The involvement of multiple assessors coupled with lack of grades in CBT do not only discourage the pursuit of excellence but also make the teachers lose their professional autonomy and raise questions on the reliability and validity of assessment practices (Jellema, 2003, Allais, 2003, Hellwig, 2006).These factors have resulted to different kinds of CBT curricular, models, principles and characteristics, learning processes, assessment practices and operationalisation of the concepts. (Merriënboer, Klink and Hendricks, 2002).

In spite of these concerns, CBT is believed to have transformed the VET sectors and economies of many countries through increased skills and productivity, efficiency, effectiveness and quality products (Mulahly & James, 2000). In the context of teaching and learning, CBT is said to have increased strong linkage between theory and skills, industry-focused, student-centredness, active and exploratory form of learning among trainees (Swailes & Roodhouse, 2004, Cremers et al, 2005). Even though, trainees undertaking the CBT in Ghanaian polytechnics have not entered the labour market, it is equally important to investigate the extent to which these benefits and criticisms relate to the teaching and learning practices.

4.1.3 Competency-based training: the case of Ghana

In Ghana, CBT was introduced in the Technical and Vocational Education and Training (TVET) system to equip graduates with the required workplace and professional skills so as to reduce graduate unemployment. A report from the study undertaken on the TVET in Ghana by the Japanese International Cooperation Agency (JICA) revealed that 'the Curricula of Higher National Diploma (HND) were more theory-oriented than the craft and technician courses, with theory-based form of assessment' (JICA, 2001, p.49). In a labour market study on the performance of tertiary graduates in Ghana, Boateng and Sarpong (2001) observed that some employers took prospective employees through longer orientation and probation schemes after which the best performing candidates were selected.

Inadequate practical training in the polytechnics has caused an emerging trend in the study programmes where a greater number of students pursue Business-related programmes to the neglect of the Engineering and Applied Sciences and Technology. Out of the 28 elective programmes offered in the polytechnics, only four (4) are in the Business, 13 are in the Applied Arts, Science and Technology whiles 11 fall under the Engineering programmes as shown in Figure 3.1



	BUSINESS	ENGINEERING	APPLIED SCIENCE & TECH.
2001	48,9	35,1	16,0
2002	57,6	24,6	17,8
2003	63,3	22,6	14,2
2004	59,2	24,3	16,4
2005	57,7	22,4	20,0
2006	60,7	21,3	18,1

Figure 4.1 Distribution of the polytechnic graduates and their study programmes (2001- 2006)

Source: National Board for Professional and Technician Examinations (NABPTEX)

In Figure 4.1, between 2001 and 2006, over a half of the graduates from the polytechnics completed from the Business programme. Only 21% - 35% are from Engineering and less than 20% from the Applied Arts, Science and Technology.

The CBT in Ghanaian polytechnics covers five disciplines: Agricultural Engineering, Fashion Design, Building Technology, Civil Engineering and Automobile Engineering. Its implementation therefore, requires the interplay of stakeholders and other crucial factors that may directly or indirectly affect the training programmes. These include accreditation procedures, effective monitoring and evaluation, collaboration between industry and educational institutions, lesson delivery and assessment practices as shown in figure 4. 2.

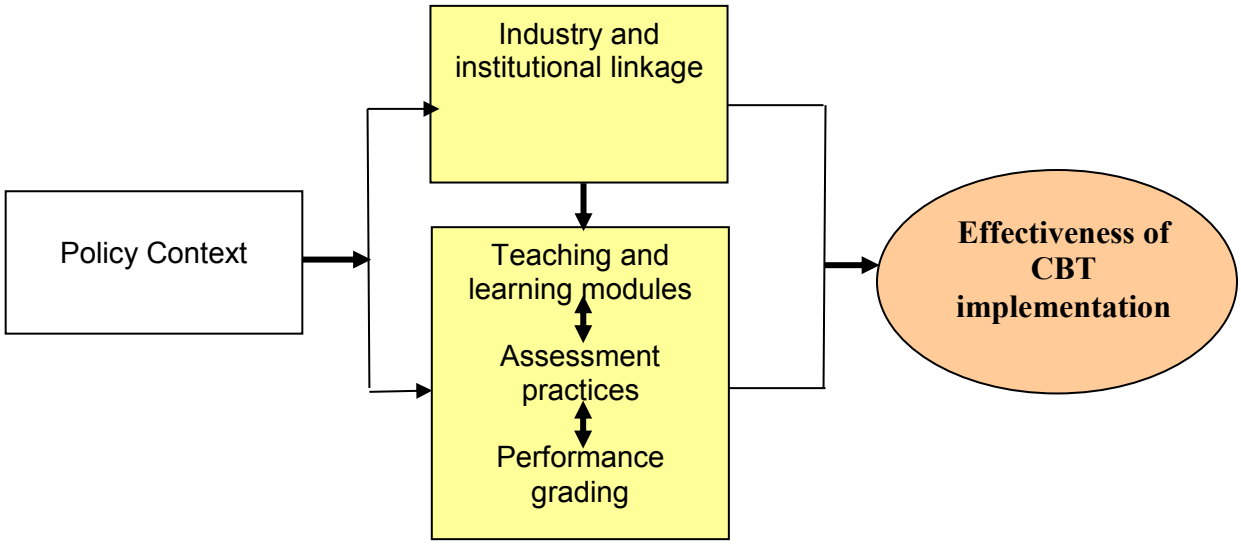


Figure 4.2 A conceptual model for the implementation of CBT in Ghanaian Polytechnics

Policy, in terms of the government's education policy, funding, accreditation and quality assurance procedures exert indirect effects on the implementation of CBT programmes. The linkage between industry and educational institutions (polytechnics) assumes a direct effect on teaching and learning modules, assessment practices and performance grading. These factors have direct effect on CBT implementation. The dependent variable is the effectiveness of CBT implementation which is indicated by the number of CBT features utilised in the training programmes. The independent variables are the linkage between industry and institutions, teaching and learning modules, assessment practices and performance grading.

4.2 Research question

The following research question was formulated. To what extent are the linkage between industry and polytechnics, the use of a modular structure, assessment practices and performance grading indicators of the effectiveness of CBT implementation?

4.2.1 Research sample and methodology

In this study, two surveys were conducted on both students and lecturers and an interview schedule on the polytechnic administrators in all the 10 polytechnics in Ghana from November 2007 to March 2008.

A sample of 540 students (270 students of CBT and 270 students of non-CBT) was drawn from a population of 1012 students. Out of this number, (232) 86% of CBT students and (208) 77% of non-CBT students participated in the study. Participants were drawn from two programmes, namely, students who were undergoing CBT programmes and their counterparts in the same programme, but not competency-based. Among the CBT students, were 187 males and 45 females while the non-CBT consisted of 184 and 24 for males and females respectively. About 70% of the CBT groups were in their second year with only

30% of them in their first year of study. Participants in the non-CBT were final year students and the last batch of students in the programmes under review.
A sample of 75 lecturers was drawn from a population of 128 lecturers from the five programmes under review. A total of (61) 81.3% lecturers participated in the study. The lecturers in the study consisted of 58 males and 3 females. All the participants were full-time teachers in both the CBT and the non-CBT programmes with an average of eight years teaching experience in their fields of specialization. About 66% of the lecturers also had three years' experience in teaching CBT courses and 72% had five years of related work experience.

The polytechnic administrators included heads of department and deans of faculty. Out of the 20 administrators selected for the study, (17) 81% of them actually took part in the interview. They were made up of 11 heads of department and 6 deans of faculty all of whom were males. The high number of males in the study may be due to the fact that, apart from Fashion Design, all the other CBT programmes were apparently male-dominated.

The curricula and training environment of the five CBT programmes have been redesigned to be competency-based. At every polytechnic there is one of these study programmes being run as CBT and all the CBT programmes started in September 2006.
The students' questionnaire consisted of 32 items with parallel sections for both students in CBT and the traditional programmes, while a 41-item questionnaire were designed for the lecturers and 18-item interview schedule for polytechnic administrators. These techniques sought to explore in-depth ideas on development of curriculum, pedagogical practices and the learning culture in the various CBT programmes. Other issues considered were adequacy of resources for training, assessment and grading practices, industrial attachment, successes, challenges and recommendations for the improvement in the teaching and learning processes.

Face-to-face interviews conducted on the administrators lasted between 60 to 90 minutes and the insight gained from this technique was used to triangulate and corroborate the results that emerged from the study. Responses to both students' and lecturers' questionnaires were analyzed using the independent sample T-test to determine significant differences between the mean scores of the groups. The results were organized and presented under four main themes. Twelve specific items that were common to both the students' and lecturers' questionnaires under the four main themes have been presented in Tables 4.1 and 4.2.

4.2.2 Results

4.2.2.1 Institution and industry linkage in training programmes
The introduction of CBT in VET is to ensure that workplace standards form the basis of the curriculum used in the training programmes. However, results from Table 4.1 did not show much involvement of industry in both the CBT and non-CBT training programmes. As

shown in Table 4.1, the p-value (0.10) is greater than the alpha value (0.05) which implies that industry involvement in CBT is not significantly different from non-CBT students.

Table 4.1 Comparison o*f mean scores between CBT and Non-CBT students*

	CBT STUDENTS		NON-CBT STUDENTS			
Issues	**M**	**SD**	**M**	**SD**	**N**	**p-value**
Industry involvement in students' training	2.14	1.080	1.97	1.172	435	0,10
Selection of Training and Learning modules	1.67	1.242	1.69	1.139	342	0,90
Progression from one module to another	1.99	0.866	2.03	0.668	398	0,59
Criteria for assessment	2.17	0.734	2.56	0.940	416	0,00
Place of practical assessment	2.25	0.762	2.13	0.636	431	0,78
Grading of performance	4.20	1.547	5.00	1.293	435	0,00
Suitability of the method of grading	2.75	1.821	2.24	1.315	326	0,00
Credit for prior Learning	1.59	0.493	1.64	0.481	392	0,34
Assessment for prior learning	2.23	0.724	2.94	0.890	127	0,00
Learning in the classroom	1.67	0.657	2.14	0.641	437	0,00
Challenges faced in the teaching and learning	2.14	1.260	2.28	1.051	141	0,48
Recommendation for improvement in CBT	2.06	0.980	2.18	0.902	355	0,25

The students generally, perceived supervision in practical internship programmes as the crucial role played by the industry in their training. The lecturers however, mentioned some other roles played by the industry in students' training programmes. As shown in Table 4.2, the p-value (0.00) recorded between lecturers and both CBT and non-CBT students is less than the alpha value (0.05). This implies that industry plays significant roles in both CBT and non-CBT training programmes. The perception of the lecturers was based on some expected roles that must be played by the industry in the students' training programmes, which in practice, do not form part of the students' learning process. This means that, the industry and institution context evidenced by the development of competency standards, provision of essential job skills and competencies, assessment of projects among others are not seen in the CBT implementation and therefore, has little influence on the current practice of CBT in the polytechnics. As mentioned earlier, readers need to be more careful in interpreting the findings particularly from the industry dimension because of low reliability index. Further findings from the study however, appeared to support the research model presented in Figure 4. 2. It was revealed that the curriculum and assessment procedures in the training programmes receive accreditation, monitoring and evaluation by the accredited agencies of tertiary education in Ghana.

4.2.2.2 Preparation of teaching and learning modules

On the selection of teaching and learning module, the p-value (0.90) observed in Table 4.1 and p-value (0.26 and 0.29) in Table 4.2, are each greater than alpha value (0.05) which imply that selection of teaching and learning modules in CBT is not significantly different from the non-CBT delivery. The lecturers, CBT and non-CBT students were of the view that it was the sole responsibility of lecturers to select teaching and learning modules. Interactions with the faculty deans during the interviews also confirmed that students' views and inputs were not sought in selecting learning modules. As CBT is learner-centred, learning materials need to fit into the needs of the learner. It is therefore, the responsibility of both lecturers and students to make inputs into the selection of modules.

This practice, however, raises questions as to whether students most of whom are very young and without workplace experience could make informed contribution to determine what needs to be learnt or appropriate modules that are required in the workplace. Apparently, this principle of CBT undermines the fundamental role of the teacher to decide appropriate learning modules and relevant materials to achieve the set objectives. Again, both the CBT and non-CBT students indicated that progression from one module to another occurred either at the end of semester or determined by the instructor. In contrast, the lecturers and the faculty deans reported that progression occurred after the student had mastered a specific skill. Consistent with the lecturers' responses is the principle of mastery learning that underlies the philosophy of CBT. The main issue here is whether the views of the lecturers are actually put into practice. While assessment of students' learning constitutes a major challenge to most practitioners in CBT, it is difficult to imagine the amount of time, attention and energy that would be spent on each student in a large class to master a specific skill before a new module is learnt.

*Table 4.2 Comparison of differences in the mean scores between lecturers and both CBT **non-**CBT students*

Issues	Lecturers *vs* CBT students Mean difference	p-value	Lecturers *vs* Non-CBT students Mean difference	p-value
Industry involvement in students' training	2.382	0.00	2.559	0.00
Selection of Training and Learning modules	0.203	0.26	0.187	0.29
Progression from one module to another	-0.508	0.00	-0.55	0.00
Criteria for assessment	-0.285	0.01	-0.674	0.00
Place of practical assessment	-0.022	0.86	0.1	0.46
Grading of performance	-0.379	0.07	-1.208	0.00
Suitability of the method of grading	-0.996	0.00	-0.485	0.01
Credit for prior Learning	-0.078	0.30	-0.123	0.10
Assessment for prior learning	0.433	0.06	-2.73	0.24
Learning in the classroom	1.891	0.00	1.421	0.00
Difficulties faced by learners	-0.224	0.17	-0.365	0.23
Recommendation for improvement in CBT	2.632	0.00	2.517	0.00

4.2.2.3 Assessment practices and Recognition of Prior learning (RPL)

The study further showed clear variations in the criteria to assess learning modules. Whiles the CBT and non-CBT students provided various responses other than what the trainee can do in a work or simulated environment, the lecturers indicated written work, practical examination, presentations, written or project as a means of assessing a learning module. The multiplicity of these responses implies that, assessment in both CBT and non-CBT programmes were generally theoretical with less practical activities. Moreover, a greater percentage of CBT students and lecturers confirmed that practical assessment mostly occurred in the classroom or in a simulated environment and to a lesser extent, at the workplace and workshops. This practice was widely criticised in the United Kingdom where training and assessment for the National Vocational Qualification (N/SVQ) took place in colleges or agencies premises (Swailes & Roodhouse, 2004). It must be emphasised however that, what a trainee can do as a main criterion for assessment is not enough to make one competent in a job. Competence must be seen in holistic terms and that includes the underpinning knowledge, values and attributes that underlie the performance of a specific task

The p-value (0.34) recorded in Table 4.1 and p-value (0.30 and 0.10) in Table 4.2 are each greater than alpha value (0.05) which further reveal that learners' prior knowledge and skills are not assessed for credit transfer or exemption from certain courses in the training.

Recognition and transfer of skills remain one major challenge that faces the VET systems of many countries. Though RPL forms part of the Australia, UK, and Netherlands' pathways to vocational qualification, its implementation has not been very effective in the VET systems due to factors such as inadequate resources, time, and complex processes of gathering evidence about applicants. (Mayet, 2006). The issue of de-recognising the prior learning of trainees is not only seen as unnecessary repetition of the competencies, skills and knowledge but also a disincentive to skill development and achievement of vocational qualification. Palmer (2009) notes that RPL is important to facilitate an individual's move from informal to formal economy, and from less to more productive employment.

4.2.2.4 Mode of lesson delivery and performance grading

The p-value (0.00) recorded for learning in the classroom in both Tables 4.1 and 4.2 is less than the alpha value (0.05) which implies that training delivery in the CBT and non-CBT programmes involves self-paced as the teachers facilitate the learning process. The adoption of CBT into the curriculum of a training institution requires a paradigm shift not only in the instructional process but also in the grading system. Though, facilitation and self-paced learning were used in the CBT lessons, both groups relied on lecture notes and assignments, and to a lesser extent, on group discussion and lessons delivery were generally lecture-centred. It must be emphasised however, that in CBT the method of instruction must be learner-centred and small group discussions whiles lecturers offer guidance and timely feedback to students towards the mastery of the required skills

On the method of grading, the non-CBT programme used the letter grading for class distinction among the performances of other students whiles the CBT programmes blended the letter grading with the prescribed non-grading system such as competent (Pass) or not yet competent (Fail). The principle of non-grading in CBT is that the outcome of the training is specified in a single performance criterion which can either be demonstrated (competent) or not (not yet competent). Criticisms against non-grading and the use of both criterion and norm-referencing have been raised by several researchers against CBT systems in the UK, Australia and South Africa (Arguelles & Gonczi, 2000, Allais, 2003). These concerns among others have actually undermined the reliability and validity of assessment practices in CBT programmes to the effect that there is no mutual recognition of applicants' previous learning, credits transfer or qualification between universities, VET colleges and unrelated fields of study (Smith, 2004).

Challenges identified in the implementation of CBT in the Ghanaian polytechnics are many and varied among the students, lecturers and administrators. These include inadequate training materials and equipment, increased workload, insufficient learning support from lecturers, learners' difficulty to study on their own due probably to the paradigm shift of the role of the teacher. It was noted from the interviews that there was poor managerial support, behaviouristic form of training, lack of uniform assessment procedure and the continuous use of traditional method of teaching in CBT courses. Apparently, these challenges have been part of CBT implementation in the VET systems worldwide (Sullivan, 1995; Haimson & Hulsey, 1999; Mulder, 2004). It is important to point out that, solving these problems in

any VET system with or without CBT programme would improve the teaching and learning environment as those problems were identified in both systems. In this sense, CBT must not be seen as a substitute but rather, a supplement to skill development in the VET system.

4.3 Conclusion

Generally, the level of understanding of CBT is consistent across the management, staff and CBT students in the polytechnics in Ghana. However, the current implementation of CBT in Ghanaian polytechnics have not attained the level of CBT required by government VET policy as current practices tend to lag behind the policy imperatives particularly in the utilisation of the CBT features. As it is currently being practised, only six of the features of CBT explained in section 4.1.1 in this study partially form part of the implementation processes. These include involvement of industry, training based on workplace standards, modular structure, assessment based on demonstration of skills and knowledge and to a lesser degree, self-paced learning and criterion referencing. Six other features such as the use of RPL, training focused on the outcome of learning, flexible training, nation-wide recognition of competencies and non-grading form of assessment are yet to be implemented in the CBT system. It must be emphasized that the items in Tables 4.1 and 4.2 are not the features of CBT, they are only subscales in the main themes that seek to describe or address the extent to which specific features of CBT form part of the implementation process in the polytechnics.

In reference to the conceptual model in Figure 4.2, the collaboration between institution and the industry has little influence on the current practice of CBT in the polytechnics as industry's participation is largely seen in the internship programmes. It is crucial to strengthen the links between training institutions and industry through the formation of industry-led sector agencies such as the Australian Quality Training Framework or Sector Skill Council in the UK. Such bodies do not only maintain current standards at the workplace but also conduct periodic review of national competency standards so as to provide industry-relevant training and improve the workforce skills.

Poor managerial support, inadequate training materials and insufficient support from lecturers do not only make it difficult for students to learn on their own but also lead to low motivation and poor attitudes among lecturers towards CBT. Though all the curriculum of the training programmes have been accredited and quality assured, confusing assessment procedures, use of both criterion and norm-referencing have adversely affected lesson delivery in CBT programmes. In this regard, the extent of CBT implementation has not been sufficiently influenced by the training institutions. It is important to intensify staff and professional development programmes in CBT approach, encourage management support and adequate resources to enable CBT makes a difference in the learning process of students as well as graduates being produced into the labour market.

As it is practised currently in the Ghanaian polytechnics, CBT is far away from being fully implemented. The challenges identified in the study as well as the international experiences

(Swailes & Roodhouse, 2004, Cremers et al, 2005) show that, indeed, CBT is useful in the development of VET, but there seem to be systemic challenges with its implementation. The perception and implementation of CBT has usually been narrowly focused on operational, technical and trade skills to the neglect of values, attitudes and cultural understandings. However, attitudes are equally important as the job-specific skills. Researchers and practitioners in VET can play a leading role to develop a wider perspective of blending the behaviouristic with the holistic approach so as to bring social and cultural processes to bear on the training. Such a holistic view of VET is likely to produce workforce who do not only possess specific skills but also cognitive skills and competencies to perform in the changing world of work.

Chapter 5

Perceived effects of competency-based training on the acquisition of professional skills

Abstract

The need to develop key competencies to meet the changing demands of industry has made the introduction of competency-based training (CBT) reforms in the Vocational Education and Training (VET) system a priority in many countries. This article explores the views of polytechnic students in Ghana on the effect of CBT on the acquisition of competencies to perform professional tasks. The results show that the modular structure has indirect effects on the acquisition of skills through quality teaching and feedback. It is argued that assessment in CBT needs to move away from emphasising more on routine tasks towards the development of broad sets of generic skills and adaptable workforce.

This chapter is based on:

Boahin, P., & Hofman, W.H.A. (2013). Perceived effects of competency-based training on the acquisition of professional skills. *International Journal of Educational Development*, (Available online: 13 December 2013), in press.

5.1 Introduction

New technologies and globalisation have compelled the labour market and employers not only to look for people who possess specialised knowledge and skills but also capable of adapting to changing situations. This development requires changes in the roles of teachers and learners in the instructional process. As teachers move away from the traditional "chalk to talk" model to become facilitators, advisers or coaches (Mitchel, 2003), learning approaches in the training programmes need to to become more student-centred, active and exploratory (Swailes and Roodhouse, 2004; Cremers et al, 2005).

However, in most developing countries the shift from 'teacher centred' 'chalk to talk' model to 'student centred' approach has had implications in several areas in term of pedagogy, assessment and curriculum (Schweisfurth, 2011, cited in Thompson 2013). These consequences are particularly related to the societal structure of these countries, containing class layers (public & private schools) and social groupings (urban & rural settings). Therefore, the replacement of the 'teacher-centred' by the 'learner-centred' model needs to be specifically adapted to the local socio-economic conditions and cultural realities of the classroom contexts in these countries.

A key approach in VET system designed to facilitate the required changes and improves the relevance of training and quality of skills is competency-based training (CBT). The aim of CBT is to ensure that the skills delivered by the training systems match the skills needed by industry in the immediate and longer term (Keatings, 2008). Despite its inherent challenges indicated in the literature (Mulder, 2004, Helwig, 2006, Smith, 2010), CBT has been adopted as central policy strategy among many nations to re-structure their VET systems and develop competences required in the labour market. The main objectives in implementing this innovation have been to reduce unemployment rate, increase productivity and to achieve international competitiveness (Arguelles & Gonczi, 2000, Callan & Ashworth, 2004). Furthermore, CBT is an outcome–based approach and considered as a major driver and motivator of the learning perspective in which the role of the individual is rated higher than that of the teachers, government or other stakeholders (Reuling, 2002). Therefore, CBT has both a didactical dimension (competences and qualifications) and a political and social component (pathways and opportunities for learning) (Deissinger and Hellwig, 2011). Countries such as the United States of America (USA), the United Kingdom (UK), Australia and The Netherlands have had several decades of experience in the implementation of CBT in their VET systems. Australia for instance, had to upgrade the skills of its workforce in order to undertake industrial restructuring and remain competitive with the other OECD countries (Keatings, 2008). Similarly, in the UK the changing nature of work and the higher skills requirements necessitated for national skills standards in order to ensure labour mobility (Matlay and Addis, 2002).

Like other countries in Africa, Ghana has experienced high levels of economic growth for more than 20 years in the range of 4 - 5%. However, these growth rates have not been

reflected by the amount of jobs creation, employment opportunities or poverty reduction among the youth (King, 2009). This argument is based on the claim that VET is built on two key productivist assumptions: (1) training leads to productivity, which results in economic growth, (2) skills lead to employability, which results in jobs (Anderson 2009, cited in McGrath, 2011). The introduction of CBT in Ghanaian polytechnics aims to bridge the skill deficiencies between the study programmes and the needs of industry so as to create jobs and reduce graduate unemployment among the youth (COTVET, 2006).

Upgraded to the tertiary status in 1992, the polytechnics education in Ghana aims to provide career–focused education and relevant skill training programmes to meet the changing needs of the students, industry and society. Entry into the polytechnics requires the completion of the general Senior High school (SHS)/Senior High Technical School (SHTS) or the general technical and craft courses at Technical and Vocational Institutes (TVIs), which prepare students for the Higher National Diploma (HND). Furthermore, in some disciplines, HND holders can continue their study for nearly two years to obtain the Bachelor of Technology (B. Tech) degree, which is the highest obtainable national qualification in the TVET in Ghana. Both the HND and the B. Tech degrees correspond with the international standard classification of education (ISCED) levels 6 and 7 respectively because the programmes are specifically focused on the acquisition of intermediate or advanced professional knowledge, skills and competencies with a strong practical component.

However, over the last decade, the polytechnic institutions have not been successful in producing middle-level personnel due to reasons such as theory-based curricula and assessment, inadequate equipment and training materials, inefficient schemes of industrial attachment and apprenticeship training and weak linkage between polytechnics institutions and the industry. All these factors make it difficult for graduates to obtain placement in the job market (JICA, 2001). In a labour market study about the performance of tertiary graduates including those of the polytechnics in Ghana, Boateng and Ofori–Sarpong (2002) observed from the employers that most of the graduates lacked basic skills to complete simple routine assignment. As a result, some employers take prospective employees through longer orientation and probation schemes after which the best performing candidates are selected. A tracer study on the performance of polytechnic graduates in the Ghanaian labour market revealed that almost half of the new employees (43.8%) took additional professional training courses either to improve their skills and knowledge or to learn new competencies which they had not been taught during their training (Boahin, Kamphorst and Hofman, 2010). Inadequate practical training in the polytechnics has caused an emerging trend towards a large percentage of students (65%) pursuing Business-related programmes to the neglect of the Engineering and Applied Sciences and Technology (Boahin & Hofman, 2012).

Given these realities, the Council for Technical and Vocational Education and Training (COTVET) in collaboration with donor agencies such as the Canadian Development Agency (CIDA), JICA and The Netherlands Organisation for International cooperation in

Higher Education (NUFFIC) introduced an industry-driven CBT in the TVET systems in Ghana. This study is based on the NUFFIC CBT project in the Ghanaian polytechnics aimed at the revision of curricula in five disciplines; Agricultural Engineering, Fashion Design Building Technology, Civil Engineering and Automobile Engineering. The goal is threefold: to improve the quality and relevance of TVET by equipping graduates with the required workplace and professional skills, promote a stronger, demand-driven working relationship with the employers and reduce the graduate unemployment (NFP-NPT, Newsletter, 2005).

As an industry-focused and demand-driven form of training, CBT curriculum development requires considerable input from industry to become more relevant to the workplace requirements. The curriculum re-design involves consultation with industries to find out (1) an overview of the existing jobs, usually referred to as job profiling (2) identify the professional tasks (job descriptions), (3) the tasks and competencies required to perform the professional tasks (core tasks) and (4) formulation of learning task (course blocks). Each learning task contains a lecture, practical training, self-learning /study, a personal development plan and a complete assessment procedure ranging from simple to complex tasks for each job description. After an expert review, the final document is accredited as a curriculum blue-print or set of competency standards for an occupation, which also forms the basis for the training delivery and assessment procedures (Eggink and Werf, 2006, CBT Assessment in Ghana, 2007). After implementing CBT for a number of years, this study attempts to evaluate the extent to which the polytechnics in Ghana utilise CBT features such as modular structure, industry involvement, assessment and feedback in their study programmes to assist students to acquire the necessary competencies to perform professional tasks. These features were selected because they are closely linked to the development of professional competencies and entrepreneurial skills for workplace performance. Modularisation of courses is believed to expose students to different academic traditions of pedagogy, experiences and assessment practices which promote the development of professional competencies for successful employment (Hennessy et al, 2010). Assessment is central to modular courses that are driven by CBT to ensure mastery of each task before progressing to a more advanced one for which the initial module is pre-requisite knowledge. CBT assessment is linked with industry because it must be conducted in the work environment or in simulated conditions and learners' performances must be measured against the industry competency standards. Crebert, et al (2004) found that industry-based learning, internship and practicum improved the generic skills of students in different disciplines. Furthermore adequate practice and feedback are essential in modular courses to assist students to progress towards their desired goals.

The central research question for the study is: To what extent do features such as modular structure, involvement of industry, and assessment practices in combination with the quality of teachers and feedback influence the acquisition of professional skills?

5.1.1 CBT and the acquisition of professional competencies

As an evolving concept, the term 'competence' (as in the British context) or 'competency' (as in the Australian context) continues to be developed especially in the fields of higher education, professions and nations depending on their institutional structures and labour processes. However, Australia and the UK are quite similar in both their method of implementation and the behaviouristic stance adopted towards CBT (Biemans et al, 2004). In the UK, competence refers to the actions, behaviour or outputs which reflect skilled performance (Horton, 2000), whiles in USA, competency is defined in terms of underlying characteristics that enable an individual to achieve outstanding performance (McGuire and Garavan 2001; Dubois and Rothwell 2004). This means that in the UK, the reference point for competence is not labour but output, whereas in the USA, the focus is more on the potential and cognitive perspective of learning rather than demonstrated proficiency.

In Europe, competence is perceived as the capacity of individuals to perform specific tasks and roles to the expected standards in a given context or profession (Biemans et al. 2004; Mulder et al 2006). Thus, it involves the integration of practical and theoretical knowledge, as well as personal and social qualities within a broadly defined occupational field (Brockmann et al. 2008). In Ghana, competence is conceptualised as the capacity of an individual to perform professional tasks to a specified standard (COTVET, 2006). From the foregoing definitions, the term 'competence' or 'competency' relates to the ability to perform activities or tasks in a given occupation to the required standards.

Across all the definitions, competency is also expressed as a function of three components namely; skills, knowledge and attitudes or behaviours that enable successful job performance. Therefore, CBT may be viewed as an approach to VET in which skills, knowledge, attitudes and values are specified in order to define, steer and achieve competence standards. It is a training that focuses on the acquisition of the competencies necessary to perform professional tasks or meet the standards specified in the industry (Eggink and Werf, 2006). This implies that CBT is performance-and standards-based and involves pre-specification of learning outcomes in a realistic workplace practices, promotes self-paced learning and uses modularized curriculum materials (DeiBinger & Hellwig, 2011). However, the rapid pace of technological change and high labour mobility requires workers to exhibit a broader range of skills, professional competencies and attitudes to continually adapt and transfer skills and knowledge in different contexts. Thus, industries are in constant search of employees who are capable of combining technical skills with professional competencies in innovative and productive ways for effective participation in the emerging patterns of work and organization (Mitchel et al, 2006; Gibb and Curtain, 2004; Brown et al, 2008). These professional competencies refer to occupational tasks and generic competencies such as creativity, information communication and technology (ICT), communication, problem-solving, organizational skills, proactive, teamwork, adaptability, gathering and analyzing information. Essential to all occupations, these competencies are embedded within the competency standards and modules in all learning programmes to equip individuals to function effectively in a wide range of social settings, professions and

workplaces and also serve as the pre-requisites for self-employment and life-long learning (Goldsworthy 2003; Guthrie 2009; Kouwenhoven 2011).

The issue of professional competencies is particularly crucial in Ghana where most of the jobs on offer for tertiary graduates are mainly short-term contracts, part-time and casual hours because most graduates do not possess sufficiently the generic competencies required to perform well in a profession (Boahin et al, 2010). Feedback from employers' surveys indicates that tertiary graduates are particularly weak in professional competencies such as problem-solving, organizational skills, ICT, communication and teamwork (World Bank, 2009). At the same time, several studies indicate that teachers do not integrate these competencies into learning and assessment strategies (NCTVET 2006; NCVER 2003; Barrie 2005). It is therefore crucial to investigate the extent to which these competencies are developed in CBT implementation to assist graduates to gain employment and maintain their placements in the workforce.

5.1.2 Differences between CBT and traditional training methods

The methods of CBT are regarded as suitable alternative to the traditional forms of training for several reasons. In CBT, training is divided into learnable units or elements of competence targeted towards specific skill development. Traditional training is often generic, and not so much focused on bridging specific skill gaps to improve job performance. Furthermore, CBT training is flexible, not time-based and learning is student-centred, where learners progress through modules individually or in small groups at their own pace while the role of the instructor is that of a coach, mentor or facilitator (Hobart & Lundberg, 1995 cited in Smith & Lowrie, 1998, Eggink & Werf, 2006). In the traditional programmes, training is centred on subject contents, and the instruction is time-based and teacher-centred, where the role of the instructor is typically restricted to that of the expert, while class size is large and the teaching style is lecture-oriented.

CBT is organized in modules, performance-based, practically-oriented, and theory is taught mainly as underpinning knowledge usually at a workshop and workplace or in a simulated environment. Many traditional programmes merely focus on the acquisition of large amounts of knowledge, with a small emphasis on structured practical activities often performed simultaneously by all class members within a classroom setting. Assessment in the traditional training is primarily based on performance of written test and practical assignment and achievement is compared with other students taking the course (norm-referenced). In CBT, assessment is geared towards clearly specified criteria or standards in the industry and the outcome of the training is measured against a single performance criterion (criterion-referenced) which can either be demonstrated as competent (pass) or not yet competent (fail).

In the traditional training, there is no structured system of recognition of prior learning (RPL) and that credit for prior learning is open to interpretation. In CBT however, trainees

who already possess special skills through previous formal training, work or life experience can receive credits for or exemption from modules which contain those specific competencies. CBT is also customized to meet the skill development needs of an organization and its employees than the traditional training that is often generic in nature. In short, CBT allows for a more precise match between education / training and on-the-job needs (Cremers, Eggink & Hoetink, 2005).

5.2 Utilising modular structure, industry involvement, assessment practices, quality of teachers and feedback in CBT

5.2.1 Modular structure

Modularisation of courses involves the packaging of course content, either theory or practical, into shorter, logically self-contained units. The association of modular courses with CBT has been promoted by earlier behavioural approaches to CBT adopted by countries such as Australia and the UK. As a result, modularisation has been a key element in the implementation of CBT in the VET systems of many countries with the aim of producing graduates with specific competencies. Furthermore, it is to ensure success and mastery of each task before progressing to a more advanced one for which the initial module is pre-requisite knowledge.

Shorter, self-contained units are very useful in meeting the needs of industry in a relatively shorter period as modules can be designed to provide specific training in skills relating to specific occupations or industries rather than to be part of a long term-training for broader professional development (Cornford, 1997). This is particularly useful in VET system which is usually driven by global economics, industry restructuring and changes in science and technology (Curtain, 2004). It also facilitates the recognition of prior learning and credit transfer as the course content can easily be assessed and credited. Although other non-CBT courses are organised in modules to enhance the teacher's work and to increase opportunities for interdisciplinary study (Hennessy et al, 2010), it is considered a special feature of CBT as it represents a certifiable part of a job that can be studied separately to acquire the specific competencies required for a job.

In Ghana, the CBT study programmes in the polytechnics have been organised into modules and each module contains specific competencies required for a job. However, to acquire a national certification (Higher National Diploma) requires the completion of all modules within the specific skill area, along with the related support subjects (NCTVET, 2006, COTVET, 2006). Learners' rate of progress through the programme is determined by demonstrated competency rather than time or course completion. However, modularisation of courses particularly in the behavioural approaches of CBT has the potential to fragment units of knowledge because of its focus on output without substantial knowledge and generic skills (Conford, 1997; Wesselink et al, 2010). Evidence and complaints from the students of modular courses in the polytechnics show that essential and pre-requisite skills are often not properly learnt from previous modules for success in current modules due to

inadequate practice or revision of previous modules (Boahin and Hofman, 2012). This means that students need to be taught learning–to–learn strategies to ensure mastery of separate modules, construct links between previous and current modules and to achieve professional competencies for effective workplace practice.

5.2.2 Involvement of industry

Industry's involvement is critical to the relevance and success of CBT in all phases of the training programme; including the design of the competency-standards, development and review of curricula and assessment strategies, apprenticeship training, monitoring and evaluation of training courses. As the study focuses on the perceptions of student, the involvement of industry would be limited to students' industrial attachment or internship. On-the-job training, internship or industrial attachment involves training on the job during normal operational conditions, and on-site training, which is conducted away from the work process (Australian National Training Authority, 2003). It affords the trainees the opportunity to understand what, how and why they are learning in the classroom. In addition to the acquisition of technical skills and transfer of learning, training at the workplace enables learners to acquire other generic skills such as communication, teamwork, problem-solving and adaptability skills that are equally required to perform professional tasks (Waterhouse and Virgona, 2004, Crebert et al, 2004).

In Ghana both training institutions and industry collaborate to ensure students' placement, supervision and assessment during the industrial attachment. Students' attachment period takes place during the end of the second semester of the first and second years of study, usually in the long vacation. The attachment duration ranges from 6 to 8 weeks (a total of 12 - 16 weeks) in a study programme and attracts a total of four (4) credit hours per period. After each attachment period, the student is assessed by the industry or organisation and the polytechnics together with the students' own report, which are scored as part of the semester's assessment. However, the involvement of industry in CBT implementation in Ghana is a contested issue. A study by JICA (2008) for instance, found no evidence of industry involvement in the implementation of CBT in the Technical and Vocational Education and Training (TVET) study programmes. Other studies in the polytechnics show that mentoring students on internship programmes is the significant role of industry's participation in the implementation of CBT in Ghana (Boahin and Hofman, 2012).

5.2.3 Assessment practices

Competency-Based Assessment (CBA) is defined as a process of judging competency against the prescribed standards of performance (Argüelles & Gonczi. 2000). It focuses on the relevant knowledge, skills and attitudes of a professional task and occurs in a real, authentic or simulated environment. In CBT, assessment is central in modular courses to provide information about the discrepancy between the current status of performance and the desired learning goals. Feedback from assessment offers strategies to understand a task,

empower students to self-regulate their learning to attain mastery (Black and Wiliam, 1998; Harlen and Crick 2003).

In Ghana, the practical component of assessment covers 70% of the total marks of the final grading and it includes structured industrial attachment, institutional practical, field and project work. The theory segment covers 30% marks of the final grade and includes presentations, case studies, assignments, course work, tests and end of semester examinations (NABPTEX, 2007). Performance criteria include attendance, participation, teamwork, assignments, research work, quizzes and presentations. The assessment of practical component is particularly based on the demonstration of skills, preferably at the work environment, or simulations on the job conditions and students are assessed as 'competent' or 'not yet competent' against the industry competency standards.

However, assessment against pre-defined standards tends to restrict assessors' judgment on competencies related to innovation and future operations at the workplace (Guthrie, 2009, Smith, 2010). Therefore, effective development of skills or expertise cannot be judged from one-shot assessment task at the end of each module but requires consistent performance and feedback from multiple assessment or observations by the assessor over a relatively long period of time. Successful performance therefore, could be judged from the ability to demonstrate skills, the underlying principles and to translate it into effective practice. The use of well-structured observation, check-lists and rating scales in the assessment process are also criticised as labour-intensive and time-consuming exercise (Biemans, et al 2004, Hellwig, 2006, Boahin and Hofman, 2012).

It is for these concerns that Smith (2010) expressed the need for teachers and industry personnel to acquire high-level educational skills and qualifications for proper delivery of CBT.

5.2.4 Quality of teachers and feedback

The concept of quality teaching is both complex and contested as it is not easy to identify what constitutes a good quality teaching or define suitable methods to evaluate and develop the teaching workforce (Peng et al 2013). However, recent studies identify three broad areas as teaching variables that are positively associated with students' achievement. These are teacher professional competence and related beliefs and attitudes, teacher classroom practice and professional activities and classroom and school level environment (Scheerrens 2007 and OECD 2010, cited in Peng et al 2013).

Like any other teaching innovation, the success of CBT implementation also depends on the quality of teachers. This is because CBT is built on the philosophy that almost all learners can learn equally well if they receive high quality of instructors and sufficient time (NCTVET, 2006, Smith, 2010). In the self-paced training, teachers in CBT need to change their traditional role as information-provider to become facilitator, coach, assessor, educational developer and resource person (Gauld and Miller, 2004; Tigelaar et al, 2004;

Seezink, 2009; Wesselink, 2010). This means that students also require immediate feedback, periodic promptings, and repeated reinforcement at every stage in the learning process to close the gap between current understanding or performance and the desired goal (NCTVET, 2006). Feedback particularly needs to be provided about (1) the task, (2) the process used to complete the task, (3) self-regulation and finally (4) oneself as a person, usually in the form of compliments, grades or praises (Hattie and Timperley, 2007). In such environment, the students become more responsible for their own learning and progress as they demonstrate self-regulatory attributes like self-monitoring, self-evaluation, self-assessment and self-teaching (Hattie, 2009). However, given the intense concentration of the content in the CBT modules, teachers often do not have sufficient time to support the students properly during the training sessions, for example by offering the opportunity for re-submission of task, feedback and coaching. (Boahin & Hofman, 2012). However, feedback gained from formative assessment is absolutely essential in effective skill training and the development of expertise (Cornford, 1997). It is therefore crucial for teachers to consider the nature of feedback, the timing, and how students interpret feedback information as the key to develop positive attitudes towards skill training.

5.3 Model for CBT implementation in Ghanaian Polytechnics

The literature reviewed demonstrates that there is a wide range of factors which influence the acquisition of competencies required to perform professional tasks. Figure 5.1 presents the framework which guides the current research. In this framework, it is proposed that achievement of competencies for effective work practice is influenced essentially by modular structure, involvement of industry and assessment practices mediated by the quality of teachers and feedback.

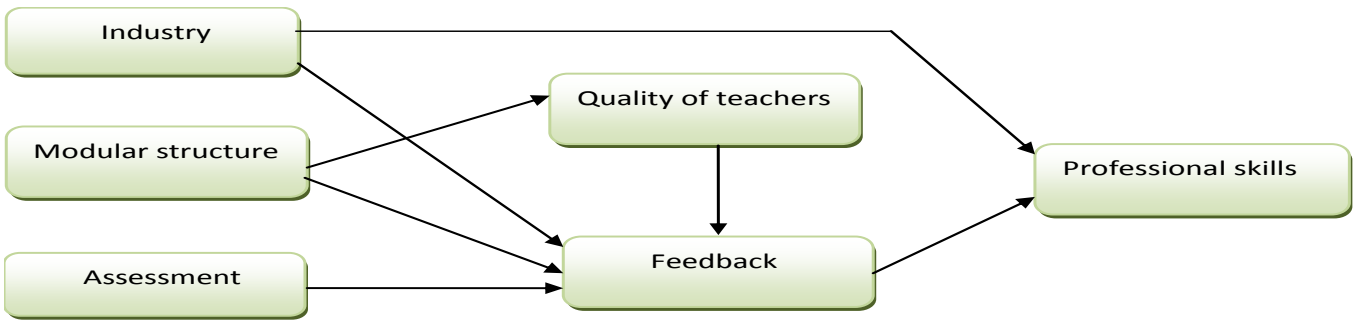


Figure 5.1 A research model for the implementation of CBT in Ghanaian Polytechnics

As a module represents a certifiable part of a job that can be studied separately to acquire the specific competencies required for a job (Hennessy et al, 2010), we assume that the use of modules would have an indirect effect on the acquisition of required competencies through quality of teachers and feedback. This premise is based on the fact that learning

modules or materials do not function in isolation to enhance learning outcomes, but are dependent on and need to be compatible with teachers' pedagogic practices, professional values and language proficiency(ies) (Tikly and Barrett, 2011). Studies on authentic assessment show that when students' assessment is in line with their future professional practice, they are encouraged to study more intensively and thereby develop more professional competencies (Gulikers, 2006). We hypothesize that assessment would have an indirect effect on the acquisition of required competencies through periodic promptings and task-oriented feedback. Industry-based learning, internship and practicum are said to assist learners to acquire both technical and other professional skills required by employers (Waterhouse and Virgona, 2004; Crebert et al, 2004). We also expect that, through workplace learning and internship, industry may assume a direct or an indirect effect on the acquisition of competencies. We expect an indirect effect of quality of teachers on acquisition of professional skills through feedback because CBT is student-centred, self-paced and mastery learning which requires coaching, immediate promptings and repeated reinforcement at regular intervals in the learning process. Providing timely feedback with corrective advice and repeated reinforcement on students' performances is expected to have direct effect on the acquisition of required competencies needed to perform professional tasks (NCTVET, 2006, Misko, 2000).

5.4 Data and method

5.4.1 Design

This study utilised a descriptive survey design to evaluate the perceived effect of CBT on the acquisition of professional skills in Ghanaian polytechnics. A combination of questionnaire, interview and observation were conducted on students and industry personnel. The study focused primarily on the perceptions of students because they are the focal point of competence development and placed higher than the teachers, government and other stakeholders because they are expected to take charge of their studies and learn at their own pace in preparation for future workplace culture (Reuling, 2002, Jonnaert et al, 2007, Wesselink, 2010). Furthermore, students perceptions tend to drive their learning (Lizzio & Wilson, 2004) and that looking through their viewpoints could provide useful information about the quality of the teaching and learning process.

5.4.2 Participants

In a cross-sectional design, participants were selected from each year group of students in all the ten (10) polytechnics through dimensional sampling. The aim was to obtain a broad range of views of students from diverse background and experiences in the CBT programme. The dimension considered in the sampling procedure were (1) participants in the baseline study conducted in 2008, (2) non-participants in the baseline study (3) students who graduated from the SHS / SHTS and TVI's, or who had received previous post-secondary education. A sample of 500 students was drawn from a population of 1103 students in five CBT programmes. Out of this number, 316 students (63.2 %) participated in the study. The breakdown of the participants from the five programmes was Agricultural

Engineering (124)38.9% from four polytechnics, Building Technology (61)19.7% from two polytechnics, Civil Engineering (68) 21.5% from two polytechnics, Automobile Engineering (34)10.7%, and Fashion Design (29) 9.1% each from one polytechnic. The students were made up of 84.6% males and 15.4% females. Among the participants, 66.8% had entered the polytechnic education through SHS or SHTS, 17.9% graduated from TVI and 15% had received additional post-secondary education. About 51.5% of the students was drawn from the final year group who had also participated in the baseline study, 28.8% from the second year and 19.7 % from the first year group most of who had not participated in the baseline study. In each polytechnic, one of these study programmes was offered as CBT and all the CBT programmes started in September 2006.

5.4.3 Instrumentation

A questionnaire containing 63 items was developed based on the key dimensions of CBT in the study to elicit views and opinions on the perceived effects of CBT on acquisition of professional skills. The reliability of the variable scales was determined, and the Cronbach's alpha scores were found to be moderately to highly reliable (range .66 to .84) except for industry involvement which was observed to be unsatisfactory (.44). The industry dimension was nevertheless included in the analysis because of its crucial role in CBT although the outcome must be interpreted with caution. To explore whether the variables were uni-dimensional, a factor analysis was conducted on each dimension and all scales proved to be uni-dimensional.

5.4.3.1 Independent variables

The modular structure dimension refers to a logically self-contained unit of study which consists of knowledge, skill and work-related activity. It consists of seven items and rated on a four-point scale ranging from strongly agree to strongly disagree. Examples of items are '*Students progress from one learning module to another after mastering a specific skill'* and *'Assessment of learning modules involve both written and practical examinations'*. The scale anchors have been defined as: 4=*strongly agree to* 1=*strongly disagree.* The internal consistency of the 'modular structure' factor is .66.

Quality of teachers refers to teacher expertise in both technical and pedagogical skills in the delivery of CBT. Examples are '*Teachers possess adequate knowledge of the subject matter and are sufficiently skilled in the lesson delivery'* and '*Students receive adequate learning support from the teachers'*. Feedback relates to the information provided by the teachers regarding the students' performances in the context of their learning. Related items include '*Feedback provides information on the process of completing a task'*. *'Feedback information assists students to learn on their own pace*'. The Cronbach's alpha for the quality of teachers and feedback dimensions are .71 and .69 respectively.

Involvement of industry measures the role of the industry personnel in students' industrial attachment programmes in CBT. Examples are 'Industry *staff supervise and mentor*

students during the attachment'. '*Industry staff assess the students' projects'*. Although, its internal consistency was unsatisfactory (α=.44), the decision to include the industry dimension in the analysis is based on the crucial role of industry in the CBT implementation. However, the outcomes with regard to this dimension should be viewed with caution.

Assessment and grading refers to the process of judging students' performances against the desired standards. It consists of seven items, and covers the mode, focus and personnel involved in assessment, assessment criteria and grading format. Examples of the items are '*Assessment is based on demonstration of skill*s' and '*Assessment takes place in a workshop or created environment similar to the workplace'*. The internal consistency coefficient of the assessment and grading factor was .69.

5.4.3.2 Dependent variable: Acquisition of professional skills

The acquisition of professional skills constitutes the dependent variable in the study and refers to generic competencies required to perform professional tasks. These skills include ICT, creativity, communication, problem-solving, organisational, teamwork, proactive and adaptability. These skills were assessed by nine items rated on a four-point scale ranging from 4=very effective to 1= not at all effective. Examples of the items which addressed these specific skills included adaptability skills; *Ability to transfer skills and knowledge in a new situation,* and teamwork skills; *ability to work with people of different ages, race or gender.* The internal consistency of the professional skills' factor is good (alpha: .84)

5.4.4 Procedure

Given the poor internet facilities in the polytechnics, the questionnaires were personally administered and retrieved through a contact person at each polytechnic, usually the Head of Department (HOD). The first visit to the polytechnics was used to administer the questionnaire, which were retrieved in the subsequent visits. Both the HODs and the students of the study programmes under review were briefed on the purpose of the study, instructions for completing the items and assurance of confidentiality. In order to enhance the response rate of the questionnaire, the HODs received reminders via telephone and e-mail.

To validate the responses from the questionnaire technique, we observed the relevant learning and assessment processes in the five CBT programmes in all the ten polytechnics to obtain a true impression of the training sessions in the polytechnics. This involved participant observation in the training delivery using un-structured interviews with the students. A variety of industries and organisation where the students had completed their internships were also visited to obtain a more in-depth view about industry involvement in the CBT programme. To this end, semi-structured interviews of between 45 to 60 minutes were conducted with personnel working in several industries and organizations, such as the Cocoa processing company, the Automobile and the Road and Building Construction industries, Ghana Highway Authority, Ghana Water Company, Food processing company and some irrigation projects. The interviews explored the relationship between industry and

the polytechnics in the area of lecturing, mentoring students in their internships, assessment of projects and development of CBT curriculum. All interviews were tape-recorded and later transcribed in full. The insight gained from direct observation and interview techniques were used to triangulate and corroborate the results that emerged from the study.

5.5 Results

5.5.1 Analysis of the model

We tested the research model using structural equation modeling (LISREL 8.52 Jörescog and Sörbom, 2002). Figure 5.2 shows that the use of teaching and learning modules influence a substantially significant direct effect on the quality of teachers and significantly indirect effect on acquisition of professional skills through the quality of teachers (0.54 * 0.20 = 0.11) on the acquisition of professional skills. These findings seem to imply that learning modules promote quality of teaching and skills acquisition.

Furthermore, they assist teachers to provide effective feedback on the students' learning progress (beta: 0.32). In line with the formulated hypothesis, the quality of teachers also has a strong significant effect on the effectiveness of feedback because effective teaching partly requires the gathering of comprehensive information to be able to make the right decisions about the learners. We posited an indirect effect of the quality of teachers on the acquisition of professional skills through feedback. The results showed a moderate direct effect of the quality of teachers (beta: 0.20) on the acquisition of professional skills and an indirect effect through feedback (beta: 0.40). Our expectation concerning a significant effect of feedback on acquisition of professional skills was confirmed even though the effect was weak (beta: 0.11). The results suggest that teachers do not often ensure adequate practice, feedback and coaching in the learning process to assist students to acquire professional skills.

Contrary to our expectations, we observed no effects of industry involvement in the CBT programme on the acquisition of professional skills, which implies that industrial attachment in the CBT programmes in the polytechnics does not enhance the acquisition of professional skills. Similarly, we did not establish any effect of assessment on acquisition of professional skills, implying that assessment practices in the modular courses do not assist students to acquire skills needed to perform professional task.

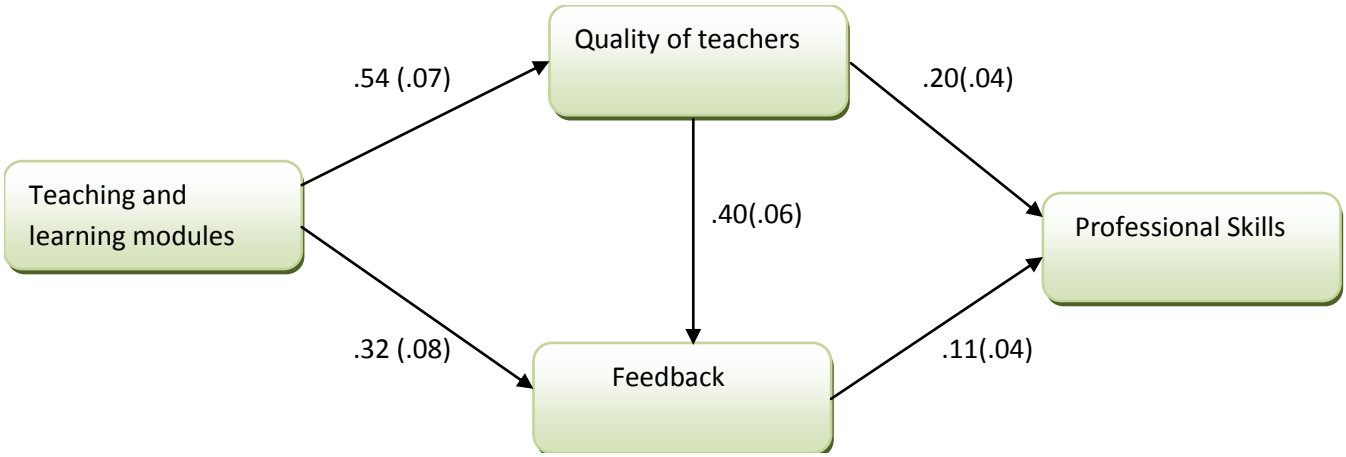


Figure 5.2 Standardised effects of observed variables (beta coefficients and standard errors)

5.5.2 Interview with personnel from industry

A number of questions were asked from industry personnel to find out the extent of industry involvement in CBT programmes in the polytechnics. On the issue of curriculum development, about 34.7% indicated their involvement in identifying essential job skills and competencies required in a specific profession. About 77% of the personnel said that they offered placement, supervised and mentored students on internship. It was further revealed that about 65% of the applicants did not obtain placement due to limited facilities, compelling students to accept placements which had little or no relevance to their study programmes. On the issue of supervision, it was revealed that internship programme in the polytechnics were not well-structured as some of the interns never received supervision from their own institutions and that the polytechnic authorities invariably relied on assessment from the industry or students' own reports. About 61.6% of the personnel further indicated that they provided lectures and assessed the final projects of students in their study.

5.5.3 Observation on training and assessment processes

In many cases, courses were organized in modules and students proceeded through the modules individually or in groups in a self-paced manner. Progression through the modules occurred after mastering specific competencies. However, students' prior learning was not recognized in the training, compelling students to repeat the same module for competencies they had already achieved. There was considerable variation in the assessment practices across the five disciplines due probably to differences in the structure of the study programmes. Although students' achievement was graded, it was measured against clearly specified criteria (criterion-referenced) and emphasized more on demonstration of skills as compared with the underpinning knowledge.

Teachers spent less time in the 'up-front teaching' method and more time in coaching, mentoring, providing periodic promptings and feedback on students' learning. In two polytechnics, experts from Automobile industry and Agriculture Extension delivered lessons and assessed students' projects in their respective fields. On a number of occasions,

students worked in teams, organized materials sequentially, used ICT and communicated effectively in the training environment. However, the training seemed to prepare students for specific competencies required to handle routine tasks and work roles instead of providing opportunity to explore their own initiatives. Therefore, innovative work practices that emphasize on critical thinking, problem-solving, creativity, proactive and adaptability skills were not encouraged in the training sessions.

5.6 Discussion

This study has explored the perceptions of students regarding the effect of modular structure, industry involvement, assessment practices, quality of teachers and feedback on the acquisition of professional skills. Modular structure was found to have indirect effects on the acquisition of professional skills through quality of teachers and feedback. This implies that appropriate teaching and learning modules enhance quality of teaching, which in turn leads to acquisition of required competencies (Bell and Wades, 1993, Hennessy et al, 2010). The results corroborate the assertion made by NCTVET (2006) that students need to be given repeated reinforcement at every stage of the module until they master the required competencies for them to move on to a more advanced one. However, students, selection of modules need to be regulated in order to achieve coherence in academic discourse and competencies required in the industry (Jenkins and Walker, 1994; Hennessy et al, 2010). Designing modules into core, compulsory and pre-requisites for entry into advanced modules would restrict students from selecting particular modules that are relatively easy to complete, or avoid a particular type of assessment or related competencies which may ultimately be crucial for employment prospects.

Against our expectations, we found a direct relationship between the quality of teachers and the acquisition of skills with an indirect effect through feedback. These results support the view that when students receive high quality of instruction, sufficient time and adequate learning materials, they can achieve the required competencies (NCTVET, 2006, Smith, 2010).

The results further confirmed a direct relationship between feedback and the acquisition of professional skills although the effect was weak. This finding seems to support the notion that teachers generally have little time to offer coaching, frequent promptings and timely feedback on the progress of students' learning in order to attain mastery of specific competencies (Boahin and Hofman, 2012). As the basis of CBT is self-paced and mastery learning, providing task-oriented feedback and corrective advice could build learners' self-esteem towards the achievement of competencies required for professional tasks (Hattie, 2009). Teachers need to provide opportunity for regular interaction with students, initiate feedback dialogue with students and peers throughout the learning process to enhance innovation and creativity.

Contrary to our expectations, the model did not show a significant relationship between industry and the acquisition of professional skills. This finding is particularly striking

because industry is critical to the relevance and success of CBT in all phases of the training programme (Smith, 2010). As indicated earlier, this finding must be interpreted with some caution because of the low internal consistency co-efficient of the items (.44). Moreover, industry involvement in this study was limited to industrial attachment programmes and students' perceptions without considering the viewpoints of other stakeholders such as teachers and industry-led agencies. Nevertheless, the findings from the interviews with the industry personnel seem to corroborate the results from the model.

The fact that students find it difficult to get placements at the industry, which in some cases are not relevant to their study programmes imply that students do not have the opportunity to apply classroom theories and experiences to real world situation. This situation does not only discourage authentic learning and acquisition of technical skills but also deprives students of developing relevant professional skills at the workplace through relations and interactions among new and old workers, personnel, behaviours and resources. This finding however, supports the results of previous studies on CBT implementation in Ghana, which have also shown that industry is not really involved in the TVET study programmes (JICA, 2008, Boahin and Hofman, 2012).

Furthermore, there was no significant relationship between assessment and the acquisition of professional skills. This result seems to support the observation made at the training session where assessment tasks focused on the students' ability to perform specific skills for predictable work roles instead of encouraging initiative and creativity. However, recent changes in technology have been causing shifts in the nature of skills requirements at the enterprise level. Therefore, the current CBT assessment methods used in the Ghanaian polytechnics needs to move away from *competence for work* that emphasizes more on routine tasks towards a *competence through work* that develops broad sets of generic skills and adaptable workforce. These findings add to the concerns and challenges associated with the assessment practices including RPL in the delivery of CBT towards the acquisition of required professional skills (Smith, 2010). Acquiring professional skills in CBT also means that assessment must not only focus on demonstrating skills but also the underlying theoretical principles and the ability to translate these into effective professional practice. More significantly, practitioners need to collect and analyse sufficient information about their students from a variety of sources and contexts so that they can adapt their skills in different settings. Failure to recognize students' previous learning experiences in assessment practices defeats the purpose of organizing CBT courses in separate modules, and undermines the learners' skill development and successful achievement of a vocational qualification (Smith and Keating, 1997, Mayet, 2006, Palmer, 2009).

5.7 Conclusions

This study was conducted in all the ten polytechnics in Ghana to investigate the perceived effects of CBT on acquiring professional skills. The findings showed partial support for the model of CBT implementation in the Ghanaian polytechnics presented in figure 5.1. The study adds a different point of view to modularisation of courses, thus promoting effective teaching and learning and hence, acquisition of competencies required in the industry. Our findings suggest that, quality of teaching is further enhanced by providing constructive and timely feedback at every stage of a module until required competencies are attained. As a powerful instrument of learning, feedback should contain task-related information and corrective advice to motivate and build learners' self-esteem towards the achievement of their professional skills. There is weak industry-institution linkage as well as poor quality of assessment practices in CBT implementation although a true CBT must be industry-focused with reliable assessment procedures in order to produce competent workforce in an evolving global economy (Sung, et al 2006; Keating, 2008). The need to develop the workplace as a learning arena capable of involving large number of students is one of the surest means to recognize diversity of interests, motivations and capabilities, while providing authentic learning and assessment environment towards the development of both technical and professional skills.

As an evolving concept, features of CBT have been variously described in different studies although there is a considerable overlap. The features described by Mulder (2004) and Wesselink (2010) provide comprehensive description of the general teaching and learning approaches in CBT and emphasize the need to situate the learning and assessment trajectories in more practical contexts (Wesselink, 2010). The features of CBT used in the current study emphasize the need for students to take charge of their own learning towards lifelong development of competencies in professional contexts and other domains of life.

This study however, has some limitations. Firstly, evaluating the perceived effects of the CBT implementation would have been more appropriate if teachers' viewpoints were consulted because convergent and divergent perceptions between teachers and students are likely to provide useful variables in investigating the teaching and learning process. Secondly, industry's involvement in CBT takes various forms, including the development of competency standards, identifying essential job skills, apprenticeship training and quality assurance.

Focusing only on industrial attachment programme to evaluate industry's involvement towards the achievement of professional skills may not have provided a true reflection of its actual role in the CBT implementation in the polytechnics. As a valuable extension to the range of aspects investigated in this study, industry's involvement in CBT implementation in the polytechnics would be explored through the viewpoints of students, teachers and industry personnel.

Despite these limitations however, the study covered all five major CBT programmes piloted in the polytechnics. As a first major evaluative study, the results are relevant for the

wide range of study programmes intended to become competency-based. The findings have added to the literature of CBT by providing students' perspectives and experiences in the Ghanaian context, thereby providing useful information for the government and COTVET in formulating their policies for the TVET system.

Chapter 6

A disciplinary perspective of competency-based training on the acquisition of employability skills

Abstract

In the changing global economy, employability skills increasingly are the focus of Vocational Education and Training (VET) institutions. This article explores the effect of academic disciplines, students' background characteristics and industry training on the acquisition of employability skills through competency-based training. A significant relationship emerges between academic disciplines and industry training on the acquisition of employability skills. Some partial evidence suggests an impact of pre-education on the acquisition of employability skills; however, no such relationship appeared between gender and the skill acquisition. The results demonstrate the need for academic disciplines to determine specific employability skills required for social and community practice,as a basis for enhancing the development of employability skills in training programmes.

This chapter is based on:

Boahin, P., & Hofman, W.H. A. (2013). A disciplinary perspective of competency-based training on the acquisition of employability skills. *Journal of Vocational Education & Training,* 65(3), 385-401.

6.1 Introduction

Rapid changes in the economy, production processes and the labour market can create imbalances between VET programmes and industry needs because it becomes more difficult to anticipate future skill needs in the workplace. Prospective employees must constantly acquire knowledge, skills and learning capacities to be able to adapt to changing operations in the industry and labour market conditions. Increased interest in employability skills reflects the development of human capital to meet the demands of the knowledge economy. As economic output becomes more information and knowledge-intensive, so is the growing need for a continual upgrade of competences that can be transferred readily across different settings. Employers worldwide look for highly skilled employees who can respond to changing, complex needs in contemporary workplaces (Andrews and Higson 2008). This means that students and prospective employees need to go beyond acquiring technical skills for any specific occupation and instead obtain generic or employability skills for successful employment (Gibb and Curtain, 2004).

Employability skills help students to develop, adapt and transform their industry-related skills to new contexts (NCTVET, 2006). Therefore, teachers should integrate such skills, together with technical competencies, to equip students to participate effectively in a wider range of social settings.

A key approach in VET systems that emphasises the acquisition of employability skills is competency-based training (CBT). The need to bridge the gap between industry and VET institutions, develop competencies and capabilities instead of qualifications is the central issue for CBT reforms in many countries (Keating 2008). Recent interest in CBT reflects a growing recognition of the need for students to acquire competencies that will benefit them in their future professions and then continue to develop those competencies so that they would be able to adapt to and anticipate future developments in their work (Wesselink and Wals 2011). Despite some common CBT features, various academic disciplines differ in their curricula, delivery, assessment and specific employability skills (Kwok, 2004, Yorke, 2007). Barrie (2005) argues that the development of employability skills requires a student-centred approach to teaching and learning that reflects background characteristics. Furthermore, employability skills might develop effectively through industry-based learning, internships and communities of practice (Crebert et al. 2004). Yet training activities in VET systems usually focus only on the acquisition of technical skills to the neglect of employability skills. That is, the skills demanded by a knowledge-based economy are poorly developed and taught in VET institutions (NCTVET, 2006). Serious concerns and dissatisfaction persist about the quality of the knowledge, skills and performance displayed by young employees (Jossberger et al. 2010), as well as the widening gap between the skills or capabilities of new graduates and the demands of the work environment in the mobile and global society (Andrews and Higson, 2008).

In Ghana for example, poor employability skills may be a major cause of increasing rates of unemployment among polytechnic graduates (Boateng and Sarpong, 2002). Upgraded

into the tertiary status in 1992, the polytechnics in Ghana are expected to provide career–focused education and relevant skill training programmes to meet the changing needs of students, industry and society. Entry into the polytechnics requires completion of Senior High school (SHS)/Senior High Technical School(SHTS) or Technical and Vocational Institutes (TVIs) leading to an award of Higher National Diploma (HND). However, in some disciplines, holders of HND can continue their study for nearly two years to obtain the Bachelor of Technology (B. Tech) degree, which is the highest obtainable national qualification in the Technical and Vocational Education and Training (TVET) in Ghana. Both the HND and B. Tech degrees correspond with the international standard classification of education (ISCED) levels 6 and 7 respectively because training is designed for intermediate or advanced professional knowledge, skills and competencies with a strong practical component.

Over the last decade, the polytechnic institutions have not been able to achieve the objective of producing middle-level skilled personnel due to reasons such as theory-based curricula, inadequate training materials and inefficient schemes of industrial attachment leading to poor job placement of graduates in the labour market (JICA, 2001). Poor employability skills among polytechnic graduates compel some employers to take prospective employees through longer orientation and probation schemes before the best performing candidates are selected (Boateng and Sarpong, 2002).

In response to these challenges, the Council for Technical and Vocational Education and Training (COTVET) introduced CBT into VET systems in Ghana to equip graduates with the required workplace and professional skills to achieve economic competitiveness at the global level, as well as reduce unemployment among the youth (COTVET, 2006). The implementation of CBT in Ghanaian polytechnics covers five disciplines, namely; Agricultural Engineering, Automobile Engineering, Building Technology, Civil Engineering and Fashion Design. In every polytechnic, one of these study programmes is being run as CBT. All the CBT programmes started in September 2006. Having implemented CBT over the past five years, it is necessary to examine if the teaching and learning processes in these programmes have enhanced the acquisition of employability skills. Essentially, this study explores how teaching and learning processes in different CBT study programmes, students' background characteristics (pre-education and gender) and industry-based learning influence students' acquisition of employability skills. Although several synonyms appear in the literature, we prefer 'employability skills' because the notion of employability highlights the skills needed by individuals in order to manage their own careers and continue learning throughout their working lives (Knight and Yorke 2003; Reid and Fitzgerald 2011).

This paper examines the concepts of competence across different countries and authors to bring to light the concerns and issues relevant to the acquisition of employability skills. The development of employability skills in the contexts of different disciplines, gender, industry

training and students' previous education are also reviewed. Finally, we develop a conceptual model with research hypotheses.
Our central research question is: To what extent do students' background characteristics, study programmes and industry training influence the acquisition of employability skills through the implementation of CBT in Ghanaian polytechnics?

6.1.1 Competency-based training

The term 'competence' is an evolving concept and therefore has different meanings for different people and nations, depending on their institutional structures and labour processes (Brockmann et al, 2008). For some authors, competence is defined as the ability to perform particular tasks and roles to the expected standards (Weigel et al, 2007) or the capacity to accomplish the key occupational tasks that characterise a profession to satisfactory standards (Kouwenhoven (2011). These definitions view competence as a functional, task-oriented and industry-focused system of training where individuals apply the relevant skills and attitudes in a required workplace environment. Moreover, over-reliance on standardised competences misses the point since changes in work practices make them less applicable (Biemans et al, 2004). In this sense, a more generic notion of competence focuses on core competencies or attributes necessary for successful job performance. These core competencies may be domain-specific that concerns clusters of knowledge, skills and attitudes related to the profession or generic because they are required in all content domains which can be transferred to new professional situations (Kouwenhoven (2011). Thus, competence is considered in relation to a context since individuals' competences differ from one context to another.

Among nations, there is also a wide variation in the concept of competence. However, the notion of competence is said to be similar in Australia and United Kingdom (UK) in terms of historical context towards the adoption of CBT, operationalisation and competency model employed to establish the qualification framework, method of implementation and the behaviouristic stance towards CBT (Kodiappan, 2011). In the UK and Australian model, the term 'competence(s)' is used to indicate the range of standards for occupational performance or profession derived from analysis of job functions in the workplace. Thus, competence in both systems reflects the expectation of employers and refers to an action, behaviour, or outcome that a person should be able to demonstrate (Weigel et al 2007). In this case, the reference point of competence is not labour but rather its output, narrowly-focused on immediate job needs with minimal underlying knowledge (James, 2001; Brockmann et al, 2008).

European perspectives on competence relate to the capacity of individuals to perform specific tasks and roles to expected standards in a given context or profession (McGuire and Garavan 2001; Biemans et al. 2004). In this sense, competence is holistic and multi-dimensional, involving the integration of practical and theoretical knowledge, as well as personal and social qualities, within a broadly defined occupational field (Brockmann et al.

2008). Similarly, in Ghana, competence is conceptualised in the context of broad occupational field, which integrates both practical and theoretical knowledge, general education as well as social and personal abilities to enhance functional mobility and innovative practice rather than existing practice (COTVET, 2006). Thus, competence is expressed as dynamic processes and that an individual is not just capable of performing particular skills in a given task but also capable of developing, learning and transferring skills and knowledge in different contexts. In this sense, the curriculum is integrated as an input with the learning outputs to develop the labour potential. However, in the United States of America (USA), competency(ies) focuses on the inputs, abilities, aptitudes and talents that a person brings to a job which enables them to perform satisfactory or exceptionally (McGuire and Garavan, 2001).Competence approach in the USA emphasises much more on potential and cognitive perspectives of learning rather than demonstrated proficiency.

Across the various perspectives, competence reflects the characteristics of individuals to perform activities or tasks appropriate to a particular context. Therefore, CBT offers an approach to training that encourages skills, knowledge, attitudes and values that are required to perform a given task in a given context. The CBT curricula development in Ghana involves consultation with industries to find out the existing jobs, industry trends, future skills needs and required competencies not only to perform a professional task but also enhance flexible workforce that is able to support change.

After expert review, the final document receives accreditation by the National Accreditation Board (NAB) and National Board for Professional and Technician Examinations (NABPTEX) as a curriculum blue-print and that also form the basis of training delivery and assessment procedures (NABPTEX, 2007). In the training delivery, knowledge, skills and attitudes are integrated in the learning and assessment processes through interactive activities such as discussion, investigations, reflection, working in teams, problem-solving, managing information and documentation. The teacher's role in this training environment is to facilitate student's learning by encouraging students to think through ideas and concepts, discriminate, select and apply knowledge and skills in appropriate contexts. Thus, the key outcome of learning is that students are able to progress to the next level of knowledge and complexity of practice.

The introduction of CBT in the VET systems of many countries has been controversial; many claims of its effectiveness lack thorough investigation or empirical evidence (Wesselink et al 2010). One of the major criticisms is the lack of consensus across countries about conceptual definitions for competence due to their different applications, theoretical backgrounds and institutional structures. Thus, we confront different CBT curricula, models, principles, characteristics, learning processes, assessment practices and operationalisations. Training has also been criticised as too behaviouristic and narrowly focused on skills, hampered by inadequate resources, poor quality assessment practices and inadequate professional and staff development (Boahin and Hofman, 2012; Wesselink et al. 2010).

However, criticisms against competence and CBT are sometimes associated with differences in meanings and operationalisation of the concept rather than its potential or the principles behind it. In the context of the changing labour market, the potential of CBT can be realised only when training programmes move away from 'knowledge and skills for performing at the workplace' towards 'knowledge and skills for performing beyond the workplace' (Kodiappan, 2011). Such a broader perspective of CBT is believed to equip students to acquire the competencies necessary to be employable and continue to develop their competencies to become adaptable labour force in a contemporary workplace (Wesselink and Wals 2011).
In this study, competency is a preferred term because of its increased usage for developing approaches, frameworks, models, modules and standards as bases for workplace learning initiatives and employability.

6.1.2 The concept of employability skills

Employability skills have different meanings as different terms are used by different countries to describe it, again with considerable overlap. In Australia and the UK, employability skills are defined as competencies, personal attributes and values that should be acquired, not only to gain employment but also to progress within an enterprise to achieve both individual's potential and the enterprise's strategic goals (Neilson 2007).

In USA, employability skills describe foundational skills on which a person builds job-specific skills. Kearns (2000) points out that employability skills may incorporate other types of generic skills or be viewed more narrowly as the skills that enable people to gain, keep and progress in their employment. Gibbs (2000) argues that the notion of employability goes beyond the possession of technical skills to feature less factual, value-driven uses of practical judgement in the workplace. That is, employability refers to both external skills and the character and attitudes of an individual. Hughes and Stoner (2001) prefer the term 'deployment skills' deployed in employment situations as a form of self-presentation, self-confidence and basic work habits.

A dynamic view of employability offered by Bagshaw (1997) and Glover et al, (2002) is not linked to possession of skills or competencies in a work situation but rather requires flexibility and adaptability to seek alternative employment in a changing world. People who are employable must be capable of setting goals and priorities, be proactive in managing change, possess necessary skills for self-advocacy and networking to cope with changing circumstances, be active in the maintenance of continuous learning and be capable of working within changing teams. This view seems to support Sanguinetti's (2004) assertion that people are responsible for becoming employable by acquiring a particular identity and set of attributes and skills required by employers.

Employability skills are crucial to all stakeholders in VET institutions, because employers recruit and retain employees with varied skills, including communication, problem-solving

and critical thinking, instead of just technical or job-specific skills (Gibb 2004; Neilson 2007). Employability skills help learners become more reflective, self-directed and capable of maintaining family and community relationships (Hager, Holland, and Beckett 2002). In CBT, employability skills form integral part of the design and structure of study programmes, assessments and staff development (Guthrie 2009). Although there are variations of employability skills across VET systems, several key skill groupings appear common to many institutions and thus, are the focus of this study: communication, creativity, information and communication technology (ICT), problem-solving, organisational skills, proactivity, teamwork and adaptability (Gibb, 2004).Studies demonstrate that people with proactive skills, for example, engage in more self-directed learning (Jossberger et al. 2010). Although various stakeholders express significant interest in employability skills, teachers still do not integrate these competencies into their learning and assessment strategies (NCTVET 2006; Barrie 2005). In Ghana, feedback from employers' surveys indicates that polytechnic graduates offer weak employability skills, particularly in terms of problem-solving, organisational skills, ICT, communication and teamwork (Boahin et al, 2010).

6.2 Employability skills in the contexts of different disciplines, gender, industry training and students' previous education

Academic disciplines provide distinct set of knowledge and skills, content and structure. However, the increasing growth and quest for knowledge prompts a tendency toward more inter- or multi-disciplinary studies to encourage learners to recognise linkages among different bodies of knowledge (Krishnan 2009). However, one of the main purposes of education is to prepare students for participation in the job market. Disciplinary instruction affords potential employers an opportunity to have some idea of the particular training, skills and knowledge that employees are likely to contribute to the organisation, which enhances the job prospects and career opportunities for graduates in specific disciplines compared with inter-disciplinary fields. Therefore, examining the acquisition of employability skills in a specific discipline should provide a clearer and more specific contribution.

Particularly, this study considers the acquisition of employability skills among fashion design, technology and engineering students. Technology and design disciplines, for instance, are said to be more activity-oriented and student-focused that allow learners the opportunity to explore creative ideas in the learning processes (Trigwell 2002). The process of investigating and designing (models, ideas, sketches, colour and fabric selections and drawings), producing (objects or repair tasks) and evaluating (outcome or final product) involve working with tools and materials including interactive activities such as discussion, investigation, reflection and peer work (Ghana MESC, 2004).

Although designers need to be technically proficient, they also require non-technical skills, such as creativity, communication, problem solving, teamwork, computer literacy and a strong aesthetic sense to remain competitive (Ghana Fashion Design Education, 2007,

Occupational Outlook Handbook 2011). Similarly, technical skills of engineering disciplines differ, but an engineer, irrespective of specialisation, is expected to possess non-technical skills to (1) solve problems with creative and innovative strategies, (2) design and develop economically viable products; (3) remain conscious of global, social, cultural and environmental issues; (4) exhibit attention to detail, numeracy and computer literacy; (5) communicate effectively, work in teams and (6) demonstrate readiness for lifelong learning (Ghana BBTec Curriculum, 2007). Studies in industry and academia conclude that the most vital employability skills for engineering are the ability to think logically, solve problems, work in teams and communicate effectively (Le and Tam 2008; Zaharim et al. 2009).

Gender-based studies also suggest differences in engineering skills acquisition. In a first-year engineering projects course, men scored significantly higher on technical skills, such as design and knowledge of engineering methodology, but women scored higher on performance skills, including productive work practices, teamwork and communication (Knight et al. 2002). Other studies similarly ranked men higher on technical skills, including confidence in basic engineering knowledge and abilities, but women ranked higher on adequate study habits (Besterfield-Sacre et al. 2001). Several studies also demonstrate that females have good study habits and tend to progress through their studies faster than males (Besterfield-Sacre et al. 2001; Knight et al. 2002; Van den Berg and Hofman 2005). Kizilan et al. (2009), investigating 436 students of VET centres rated females higher in their levels of basic and information skills than male students.

Several researchers further argue that employability skills are best promoted in industries, agencies or extra-curricular activities in work contexts (Green et al. 2009; Stiwne and Jungert 2010). Some processes used by organizations and agencies to develop employability skills include induction, buddy and mentoring systems, socialization, staff assessment and performance appraisal systems, conflict resolutions, discipline, task rotation and allocations of more responsibility (Smith and Comyn 2004). Waterhouse and Virgona (2004) indicate that on-the-job training can improve the development of employability skills, because it usually involves teamwork, interpersonal relationships, communication, self-efficacy, problem-solving and adaptation to new patterns of operations in the industry. Crebert et al. (2004) find that industry-based learning, internships, structured work experiences and employer involvement in course design and delivery improve the generic skills of students in different disciplines. Yet Kizilan et al. (2009) find no significant differences in the level of employability skills among technical students who engaged in industry training and those who did not. Lave and Wenger (1991) argue that employability skills become manifest in different social contexts through communities of practice, such as life outside home, responsibility in clubs, religious fellowships, debates, interacting with people from different nationalities and cultures, travelling overseas or doing voluntary and community work.

Finally, students' previous education may have both positive and negative effects on academic achievement. For example, students from a technical education background obtained fewer study points in one study, even though they spent more time studying and obtained better grades in their previous education (Van den Berg and Hofman 2005). In Ghana, technical institutes were established to produce graduates for entry into polytechnic education since their training involved practically-oriented, individualized and simulated workshop methods of skill training (Ghana MOESS, 2008). If technical education is modelled on CBT principles, as in the polytechnic institutes, we need to find out the level of employability skills of students with technical educational backgrounds.

6.3 Model

The debate about whether employability skills can be developed within or outside of a disciplinary context is long-standing (Keller et al. 2010). Different views emerge about the sources of employability skills, but their successful acquisition requires interrelated factors, including students' background characteristics, training institutions that network with industry, academic disciplines and government educational policies. On the basis of these assumptions, we developed a conceptual model to explain the potential influence of various factors on the acquisition of employability skills (Figure 6. 1).

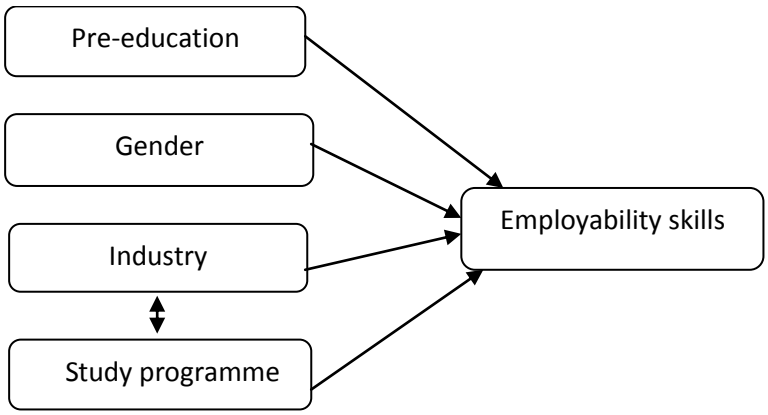


Figure 6.1 Conceptual model of the acquisition of employability skills

In Figure 6.1, pre-education refers to students who entered the polytechnic institution after completing (a) SHS/SHTS, (b) TVIs or (c) other post-secondary education. These pre-education categories should have different effects in the levels of employability skills. We expect gender differences in the levels of employability skills too. Differences in teaching and learning approaches across study programmes should exert different effects on levels of employability skills. Finally, industry-based training, in the form of internships and practicum, as well as effective collaboration between study programmes and industry training are crucial factors that should improve employability skills.

6.4 Hypotheses

On the basis of this conceptual model, we test four hypotheses:

First, in Ghana, polytechnic education was established from the TVIs to ensure progression in skills training for graduates from technical institutes. Students who entered polytechnics from TVIs should be more likely to achieve higher employability skills because they have already experienced some form of fundamental skill training.

Second, several studies confirm that females have good study habits and tend to progress through their studies faster than males (Besterfield-Sacre et al. 2001; Van den Berg and Hofman 2005). Therefore, we expect females in Ghanaian CBT programmes to achieve higher levels of employability skills than males.

Third, the use of industry-based learning, internships and practicum improve employability skills (Crebert et al. 2004). Therefore, we expect that a high level of industrial attachment in study programmes will lead to higher levels of employability skills.

Fourth, approaches to teaching in technology and design disciplines involve more activity-oriented and student-focused learning that allow students the opportunity to explore creative ideas (Trigwell 2002; Ghana MESC, 2004). We thus expect that students in building technology and fashion design disciplines acquire higher levels of employability skills relative to students in other disciplines.

6.5 Research method

6.5.1 Sampling

In a cross-sectional survey design, a sample of students from all the ten polytechnics in Ghana was randomly selected from each year group of students through stratified sampling. The aim was to obtain a broader range of views from diverse background of students and experiences in the CBT programme. The strata considered in the sampling procedure were (1) participants in the five CBT study programmes, (2) year of study (3) students who graduated from the SHS or SHTS, TVI's, or had previous post-secondary education. The study focused primarily on the perceptions of students because they are the focal point of competence development, expected to take charge of their studies and learn at their own pace in preparation for future workplace culture (Jonnaert et al, 2007, Wesselink, 2010).

A sample of 500 CBT students was drawn from a population of 1103 students in five CBT programmes. A total of 316 (63.2%) students participated, from all the five programmes: Agricultural Engineering (124)38.9% from four polytechnics, Building Technology (61)19.7% from two polytechnics,, Civil Engineering (68) 21.5% from two polytechnics, Automobile Engineering (34)10.7% and, Fashion Design (29) 9.1% from one polytechnic each The student sample consisted of 85% males and 15% females, 67% of whom entered the polytechnic after SHS or SHTS, whereas 18% attended TVIs and 15% completed other

post-secondary education. We obtained a broad range of views and sufficient experiences in the CBT programme because 52% of the students were drawn from the final year group, 28% from the second year and 20% from the first year group.

As an end-user of the education and training, industry plays a pivotal role, not only in CBT but also in the development of employability skills. Students in CBT programmes must undertake two segments of industrial attachment during their three-year studies, though the period of internship varies from one programme to another. As a major component of CBT, industrial attachment affords students an opportunity to transfer classroom theories into real-life conditions, work on a wide range of tasks, resources and different kinds of people from different backgrounds. An effective internship should enhance the levels of employability skills (Keller et al. 2010). Table 6.1 shows the descriptive statistics of industrial attachment activities undertaken by students in their respective study programmes.

Table 6.1 Distribution of participants on internship programme

Study programmes	Percentage of students on internship	Mean	SD	N
Agricultural Engineering	38.3	12.51	2.05	124
Automobile Engineering	9.5	12.87	1.61	34
Building Technology	18.4	12.83	1.82	61
Civil Engineering	20.6	11.80	1.92	68
Fashion Design	7.9	11.08	1.41	29

The Agricultural Engineering programme recorded the highest percentage of students in internship programmes. We calculated mean scores on the basis of the total number of students who engaged in an industrial attachment during their programmes. Thus, more students in the Agricultural Engineering programme did internships in their study programme and are more likely to develop higher levels of employability skills. Fashion Design and Automobile Engineering registered the lowest percentages of students undertaking internships.

6.5.2 Instrumentation

A questionnaire containing 63 items elicited views and opinions on the perceived effects of CBT for the acquisition of competencies required to perform professional tasks. The questionnaire sought to explore issues relating to the demographic characteristics of the respondents, development of curriculum, pedagogical and assessment practices, industrial attachment and employability skills. Eight items related to the internship focused on students' attachment to industry organisations. Using a structured response type with multiple options from which choices were made, students indicated the number of internships they had undertaken, the ease with which they obtained placement, the relevance of place of the attachment to the study programme, quality of mentoring and

assessment and challenges faced in the attachment programmes. The section of employability skills was adapted from the ACCI/BCA employability skills framework (2002) and modified to the Ghanaian context. A pilot test of instruments was conducted on non-CBT students (traditional programmes) in the polytechnics who were not part of the sampling frame. Feedback from university experts and the pilot test helped to revise items for the final instrument.

The independent variables in the study include pre-education, gender, industry and study programmes. Pre-education refers to students' previous education before entering into the polytechnic education. In Ghana, entry into the polytechnics requires a 4-year SHS/SHTS or TVIs. The SHS/SHTS offer general and pre-technical courses while the TVIs run pre-technical and general technical and craft courses in engineering and building technology. Thus, polytechnic education in Ghana was established from the technical institutes to offer advanced technician training and craft certificates for practice-oriented middle-level professions (Ghana MOESS, 2008).

Gender relates to males and females offering the various study programmes in the polytechnics. In Ghana, both males and females have equal opportunity to pursue any study programme in the VET system provided the student fulfils the departmental requirements. The role of industry in this study focuses on internship programmes because it gives students opportunities to work with varied tasks, resources and personnel. Study programme refers to the teaching and learning processes in the five CBT disciplines and their effect on the acquisition of employability skills.

Employability skills constitute the dependent variable. The related items include creativity, ICT skills, communication, problem-solving, organisational skills, proactive, teamwork, and adaptability. Examples of items that measure the skills include; creativity- 'ability to generate and apply new ideas and solutions', adaptability skills- 'ability to transfer skills and knowledge to a new situation', organisational skills- 'ability to prepare action plans and scheduling tasks', teamwork skills-'ability to work with people of different ages, gender or race', communication skills-'ability to prepare and present written and verbal reports', proactive- ability to initiate actions to address issues', problem solving- 'ability to identify and take steps to solve problems' ICT skills- 'ability to use IT to organise data' These skills were rated on four-point scale, ranging from 4 (very effective) to 1 (not at all effective). The internal consistency of the employability skills factor was good (alpha =.84). Table 6.2 contains the descriptive statistics of employability skills and the disciplines under review.

Table 6.2 Means and standard deviation of employability skills among five disciplines

Employability skills	Agric Eng (n=124)		Auto Eng (n=34)		Build Tec (n=61)		Civil Eng (n=68)		Fash. Des (n=29)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Creativity skills	3.11	.63	3.16	.52	3.44	.50	3.16	.77	3.20	.65
ICT skills	2.65	.79	3.13	.50	3.27	.61	2.91	.79	3.08	.91
Communication skills	3.02	.58	3.07	.45	3.31	.46	3.01	.59	3.0	.29
Problem-solving skills	2.92	.69	3.03	.55	3.19	.60	2.82	.67	3.04	.61
Organisational skills	3.04	.66	3.03	.60	3.34	.60	3.11	.61	3.16	.62
Proactive skills	3.03	.70	3.13	.56	3.34	.58	3.10	.61	3.16	.55
Teamwork skills	3.39	.61	3.26	.58	3.51	.60	3.23	.63	3.38	.49
Adaptability skills	3.04	.69	3.03	.55	3.29	.53	3.03	.60	3.04	.45

Among the skills, teamwork registered the highest mean scores across all five disciplines. In relative terms, Agricultural Engineering registered a high score in teamwork (M=3.39, SD=.61) and lowest score on ICT skills (M=2.65, SD=.79). In Automotive Engineering, teamwork recorded the highest level of skill (M=3.26, SD=.58) and relatively low scores on problem-solving, organisational and adaptability skills. Teamwork emerged as the highest level of skills (M=3.51, SD=.60) in Building Technology, whereas problem-solving recorded the lowest mean score (M=3.19, SD=.60). Similarly, Civil Engineering recorded the highest and the lowest scores in teamwork and problem solving respectively. In the Fashion Design programme, teamwork was the highest skill (M=3.38, SD=.49), whereas communication was the lowest (M=3.0, SD=.61).

6.5.3 Analysis Strategy

To answer the central research question and hypotheses, we adopted the following strategy to analyse the data. First, we present the descriptive statistics (means and standard deviations) for all independent (background characteristics, industry training, and study programmes) and dependent (employability skills) variables. Second, in four hierarchical regression analyses, we determine the extent to which students' background characteristics, industry training and different study programmes influence the acquisition of employability skills. In Table 6.3 we provide the results of the hierarchical regression analysis, which provides unstandardised (B) and standardized (β) coefficients, standard errors, t-values and p-values. In the first two models, we tested the effect of students' background characteristics, pre-education (Step 1) and gender (Step 2) on the acquisition of employability skills. In the third model, we tested the effect of industry training on the acquisition of employability skills (Step 3). The fourth model enabled us to test whether different study programmes predict different levels of the acquisition of employability skills. In this regard, all five study programmes form the final model (Step 4), with Agricultural Engineering as the baseline group. This position provided a benchmark figure or standard value from which all beta coefficient values of the other four study programmes were judged. The threshold value of the level of statistical significance was set at $p<0.05$ for moderately significant and $p<0.01$ as highly significant.

6.6 Results

We hypothesised a positive effect of students' pre-education in TVIs on the acquisition of employability skills. In support of this assumption, pre-education has a significant impact on the acquisition of employability skills in both the background characteristics (Steps 1 & 2) and industry training models (Step 3) (β=-.0145, p<.05; β=-.0143, p<.05; β= -.104, p<.05,) respectively. That is, polytechnic students who graduated from TVIs scored significantly higher on employability skills than did their counterparts from SHS, colleges of education or other higher institutes. However, with the inclusion of different study programmes in the final model (Step 4), the relationship between students' pre-education and employability skills disappeared. Contrary to our expectation, we found no significant relationship between gender and the acquisition of employability skills. This result implies that there is no significant difference between male and female students in the acquisition of employability skills. We thus reject our second hypothesis. We found a strong significant effect of industry training on the acquisition of employability skills in the final model (β=.485, p<.01). As we posited in the conceptual model, on-the-job training and internship activities help students acquire high levels of employability skills.

The results also show statistically significant differences among study programmes and levels of employability skills. This confirms our expectation that differences in study programmes, particularly disciplines that involve more activity-oriented and student-focused learning, are more likely to promote higher levels of employability skills. In relative terms, students in Building Technology (β=.287, p<.01) and Fashion Design (β=.208, p<.01) scored significantly higher on employability skills than Agricultural Engineering students. Moreover, those in Civil Engineering (β=.116, p<.05) scored moderately significantly higher on employability skills than the baseline Agricultural Engineering students.

Table 6.3 Summary of hierarchical regression analysis for variables predicting the acquisition of employability skills (N=316)

		Unstandardised Coefficients		*Standardised Coefficients*		
	Variables	*B*	*Std. Error*	*Beta(β)*	*t*	*Sig*
Step 1.	Constant	26.715	.494		54.066	.000
	Pre-education	.748	.300	.145	2.494	.013*
Step 2.	Constant	27.672	.905		30.573	.000
	Pre-education	.738	.300	.143	2.462	.014*
	Gender	-.834	.661	-.073	-1.262	.208
Step 3.	Constant	14.974	1.579		9.486	.000
	Pre-education	.534	.265	.104	2.020	.044*
	gender	.274	.596	.024	.460	.648
	Industry training	.956	.103	.485	9.247	.000**
Step 4.	Constant	15.399	1.601		9.620	.000
	Pre-education	-.071	.321	-.014	-.220	.826
	Gender	-.500	.681	-.043	-.735	.463
	Industry training	.979	.102	.495	9.565	.000**
	Agric Engineering	.000	.000	.000	.000	.000
	Auto Engineering	.637	.692	.050	.920	.358
	Build Technology	2.801	.639	.287	4.382	.000**
	Civil Engineering	1.071	.509	.116	2.102	.036*
	Fashion Design	2.863	.839	.208	3.413	.001**

*$p<.05$, **$p<.01$

6.7 Conclusions and Discussion

The study aimed at exploring the extent to which study programmes and students' background characteristics influence the acquisition of employability skills in the context of CBT in Ghanaian polytechnic institutions. Specifically, this study examines five main disciplines and several factors — pre-education, gender and industry training — and their influence on the acquisition of employability skills. The results generally confirmed significant relationships between academic disciplines and the acquisition of employability skills, though not for Automobile Engineering. Industry training provided a significant relationship with the acquisition of employability skills. Pre-education also had significant effects on employability skills in the students' background and industry training models, but no such evidence appeared in the final model. We found no relationship between gender and the acquisition of employability skills.

As expected on the basis of existing literature (Hager et al. 2002; Kwok 2004; Yorke 2007; Keller, Chan, and Parker 2010), there is a strong and statistically significant effect of study programme on the acquisition of employability skills. The results confirm the hypothesis that employability skills can best be acquired in teaching and learning environment that involve more student-centred learning (Ghana MESC, 2004 Trigwell 2002; Barrie 2005). The results emphasise the need for teachers to adopt a more student-focused approach to teaching, such as enquiry-based, problem-based, reflective learning and authentic work experiences to provide more opportunities for students to explore their own creative ideas and acquire higher employability skills. The emergence of teamwork as the dominant skill across all the disciplines in Table 6.2 is particularly significant.

Working in teams promotes the acquisition of other crucial skills, such as good communication, collaboration, problem-solving, conflict resolution, leadership and interpersonal, social and critical thinking skills (Hansen 2006; Keller, Chan, and Parker 2010). However, simply placing students in teams, without scaffolding or facilitation, is not likely to lead to skill development and attainment (Hansen 2006).

Consistent with other studies (Crebert et al. 2004, Stiwne and Jungert 2010), this study demonstrates a significant relationship between industry training and the acquisition of employability skills. These results reinforce findings that suggest on-the-job training usually entails teamwork, interpersonal relationships, communication, problem-solving and adapting to new patterns of operations in the industry, which then tend to improve the development of employability skills (Waterhouse and Virgona 2004). This finding strengthens the need for stronger and more productive links between industry and training institutions in CBT programmes, to give students opportunities to work with varied tasks, equipment, technology, resources, behaviours and personnel. Workplace learning is not only useful for authentic learning but may encourage students to establish their own jobs after completing their study programmes.

Pre-education exerted significant effects on employability skills in the students' background and industry training models, although no evidence was found following the inclusion of different study programmes in the final model. This result suggests an interaction between pre-education and study programmes and also implies that graduates from TVIs possess the basic skill training that is needed to acquire employability skills, unlike their counterparts from SHS/SHTS or other institutions. It also lends support to Ghana's decision to establish TVIs in an effort to produce basic skills training and professional skills and thus respond to the changing technological needs of industry and the private sector (Ghana MOESS, 2008). The problem of limited academic progression in the VET systems in Ghana suggests a need to offer greater opportunities for graduates of TVIs through bridging courses, portfolios or recognition of prior learning to increase their participation in polytechnic education.

In contrast with our expectations and previous findings though (Besterfield-Sacre et al. 2001; Knight et al. 2002; Van den Berg and Hofman 2005), we found no statistically significant effect of gender on the acquisition of employability skills. Unlike previous studies that have focused on various factors to determine study progress (Van den Berg and Hofman 2005) or gender and ethnicity differences in relation to engineering students' attitudes (Besterfield-Sacre et al. 2001), we considered students' acquisition of skills in the context of academic disciplines. Moreover, the current study involved substantially fewer women (15.4%) than men (84.6%) from these apparently male-dominated study programmes. Women are generally under-represented in disciplines such as science, engineering and mathematics, though their abilities in these academic disciplines are not worse than men's (Virtanen and Nevgi 2010). The low representation of females in the study does not suggest any potential existence of structurally gendered vocational opportunity in Ghanaian VET system. The results however, support Sanguinetti's (2004) contention that individuals have the ultimate responsibility to achieve the attributes and skills that employers require.

However, the acquisition of employability skills does not guarantee employment. Sanguinetti (2004) reveals that people with suitable employability skills are not always employed due primarily to factors such as a lack of jobs or employment opportunities, age and experience.

6.8 Limitations and Further Research

This study has some limitations that should be considered before generalising the findings. With the exception of Fashion Design, the study programmes were largely engineering-related and pre-dominated by male students. The fewer number of women who participated in this study might mask the true effect of gender as a variable in the conceptual model.

We focused on the acquisition of employability skills, without considering the pedagogy or assessment practices, though several concerns have been raised about the poor quality of teaching and assessment strategies (Kwok 2004; NCVET 2006; Guthrie 2009). Asking

students to report on their own acquisition of employability skills could induce socially desirable responses, rather than pertinent and true responses.

Notwithstanding these limitations, this study can inform national and institutional policies in Ghana in relation to study skills, curriculum reviews in the area of pedagogy, assessments of employability skills and funding requests to support practical training, field work or internships. Considering the concerns expressed by academics, an investigation into the teaching and assessment processes for employability skills would be an interesting focus for additional research.

Chapter 7

Summary, conclusions and discussion

7.1. Introduction

The transition from higher education to the world of work has long been an important issue for stakeholders in the HEI and VET systems. A long-standing belief asserts that graduates from HEIs, particularly polytechnics, lack adequate skills and competencies to work in industry or the business community, prompting the redesigns of the curricula of several VET systems to make them more competency-based and adopt teaching and learning patterns that emphasise competencies relevant to current and future labour market (Smith, 2010). The CBT programme seeks to equip learners with clusters of skills - cognitive (knowledge), practical (technical) and attitudinal or social (generic) - to enable graduates to function effectively in diverse job settings (Weigel et al, 2007).

Compared with traditional, theory-oriented curricula, the CBT curriculum represents a paradigm shift in pedagogical practices, including a strong practical training component and assessment processes, as well as close links between industry and the training institution to ensure a more competent workforce.

As VET is driven by global economics, Ghana must learn from countries that have decades of experiences in CBT if it is to achieve international competitiveness. To this end, the curricula of five study programmes run by polytechnics in Ghana have been redesigned as competency-based; they are being run on a pilot basis but could be replicated in other study programmes. Serious preparations are underway in the polytechnics to adopt competency-based system by re-designing their curricula and study programmes. However, new technologies and changes in the global economy require that CBT avoids a sole emphasis on technical skills for specific jobs; instead, it should focus on employability skills to help trainees become adaptable workforce in the contemporary workplaces. Accordingly, this study has sought answers to the following research questions:

1. What lessons can be drawn from international CBT experiences to support implementation processes in Ghana?
2. To what extent do the linkages between industry and polytechnics, modular structure, assessment practices and performance grading indicate the effectiveness of CBT implementation?
3. To what extent do different CBT features, such as modular structure, involvement of industry and assessment practices, influence the acquisition of professional skills?
4. How do students' background characteristics, study programmes and industry training influence their acquisition of employability skills in CBT implementation?

This final chapter presents an overview of the theoretical concepts, a summary of the results, a discussion of the main conclusions, and implications for educational practice. It concludes with some strengths and limitations of this study and recommendations for further research.

7.2. Theoretical concepts

Innovation in higher education institutions recently has focused on improved teaching and learning patterns, to develop students' competencies relevant to the needs of the labour market. The pressure for changes in teaching and learning stems from factors such as global economics, industry restructuring and policy initiatives from the government (Curtain, 2004; OECD, 2000). In response, CBT was introduced into the VET of many countries, to ensure a match of education and training with on-the-job needs (Cremers et al., 2005).

Several models of educational innovation describe the roles and strategies of various change agents during implementation processes (Fullan, 2007; Rogers, 2003). Instead of imposing ideas, structures or standards in a top-down model, the models engage all affected parties in the actual development, implementation and adaptation of the innovation, to meet local conditions. Implementing CBT as an educational innovation also requires improvisation and customisation, to achieve the desired outcomes. As CBT offers an economic tool for increased skill and productivity, the economic conditions, labour market structures, industrial organisations, trade union activities and VET tradition of the focal country must be considered to ensure successful implementation. The learner-centred approach in CBT also requires that learning materials be based on individual, cultural, market or societal needs (Brewer and Tierney, 2010). That is, successful CBT implementation must take a range of factors into account, such as students' background characteristics, the active involvement of all stakeholders, adequate resources, teachers' roles and assessment practices, networking between training institutions and industry, level of economic development and government educational policies (Fullan, 2008; Mitchell et al, 2003; Mulder, 2004a; Robinson, 2009).

With consideration of all these conditions, a conceptual model of CBT implementation in Ghanaian polytechnics was developed (see Figure 7.1). The model includes industry participation, teaching and learning modules, pre-education and gender as independent variables; the dependent variable is achievement of competence. These variables reside within the government policy context. As CBT requires the active involvement of all stakeholders, these variables are likely to interconnect among themselves. Accordingly, this study particularly examines the effects of industry and teaching and learning modules on the dependent variable (competence). It also examines the effects of students' background characteristics (pre-education and gender) on competence and their interaction with industry and teaching and learning modules.

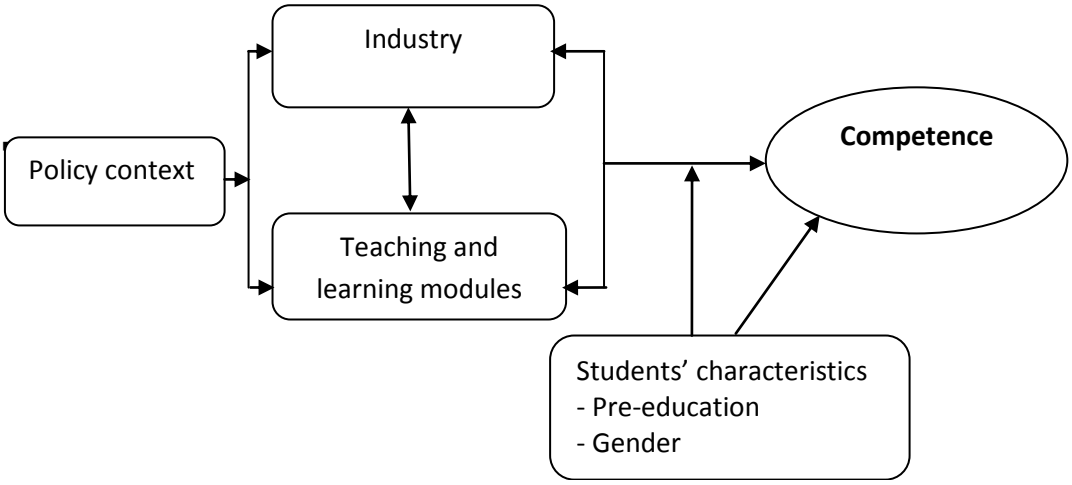


Figure 7.1. Conceptual model for CBT implementation in Ghanaian polytechnics

The policy context refers to the government's education policy, funding arrangements in higher education, accreditation and quality assurance procedures. Industry participation in CBT relates to the development of competency standards, internship programmes and quality assurance. Studies show that industry-based learning, internships and practicum improve the development of employability skills (Crebert et al., 2004). In Australia and the United Kingdom, industry-led agencies work with employers to identify critical work functions, future skill needs and training requirements, performance standards, and the skills and knowledge required to successfully perform a given occupation or field (Department of Education and Labour, 2003; Misko, 2006; Sung et al., 2006).

Teaching and learning modules refer to breaking down the curricula of study programmes into independent units, with the aim of ensuring students' mastery of each task before they progress to a more advanced level. Each module represents a certifiable part of a job and therefore can be studied separately, such that students can acquire each specific competency needed for a job. It also facilitates the process of recognition of prior learning (RPL), because candidates only need to demonstrate proficiency in relevant competencies to receive exemption or credit transfer (Smith, 2010). The modules factor also includes quality of teaching and learning, nature of feedback, assessment and grading. Effective collaboration with industry and the quality of instruction provided in the teaching and learning modules should have direct effects on the achievement of competence. We also expect students' background characteristics to exert direct effects on competence and anticipate an interaction effect with industry and teaching and learning modules. The dependent variable, achievement of competence, is indicated by the use of CBT features in the acquisition of skills and attributes required to perform professional tasks.

Four separate studies were carried out. In the first study presented in Chapter 3, we explored international experiences in CBT implementation to draw lessons to support

Ghana and other emerging VET systems. In Chapter 4, we investigated the effectiveness of indicators such as industry and training institution linkages, modular structure, assessment practices, lesson delivery and performance grading in the context of CBT implementation. The next study reported in Chapter 5, examined the perceived effects of CBT in the acquisition of skills and attributes required to perform professional tasks. Specifically, it investigated the potential influence of modular structure, industry participation and assessment practices, together with quality of teaching and feedback on the achievement of skills. A final study in Chapter 6 examined the effectiveness of CBT for acquiring employability skills across students' academic disciplines.

7.3. Design

In this dissertation, two student surveys (baseline and follow-up) were conducted to assess the effect of CBT implementation on the teaching and learning processes in Ghanaian polytechnics in a repeated cross-sectional design. The first study involved first- and second-year CBT students and non-CBT students in their third year in each study programme. Participants in the second study consisted of first-, second-, and third-year CBT students only, because the non-CBT system in all the study programmes under review had been phased out, which made it impossible to conduct a longitudinal study with all participants because the non-CBT students simply were not available for participation.

In the first or baseline study, a sample of 540 students: 270 CBT students and 270 non-CBT students, was drawn from an overall population of 1012 students. Of this sample, (251) 93% of CBT students and (208) 77% of non-CBT students participated. Thus, the first survey focused on students pursuing CBT piloted programmes and those pursuing the same study programmes but through a traditional training system. The non-CBT students comprised mainly final-year students whose programmes were about to be phased out, with the introduction of the CBT system. This first study also included CBT teachers, heads of department and deans of faculty. The questionnaires were designed for teachers and students while interviews served to gather the insights from heads of departments or deans. The goal was to assess the extent to which the polytechnics were adapting their educational practices in the context of CBT.

The second or follow-up survey focused on CBT students, with the purpose of evaluating the perceived effects of CBT on the acquisition of skills and attributes to perform professional tasks. The follow-up study consisted of 500 students of CBT, drawn from a population of 1103 students in five CBT programmes. A total of (316) 63.2% students participated in the study, including those studying agricultural engineering (124), automobile engineering (34), building technology (61), civil engineering (68) and fashion design (29).

Both studies involved all ten polytechnics in Ghana. Questionnaires for both studies were divided into six sections, with each section addressing one of the main variables: teaching

and learning modules, linkage between industry and training institutions, assessment and performance grading, acquisition of employability skills and students' own assessments of their study programmes.

7.4. Summary of results

7.4.1 International perspectives on the implementation of CBT

Chapter 3 explored CBT implementation in countries with several years of experience, such as the United Kingdom and Australia, to provide a broader overview of the directions, issues, and innovative structures in play and draw lessons for Ghana and other countries in the process of CBT implementation. The study focused on two CBT characteristics, closely linked to the achievement of employability: recognition of prior learning (RPL) and industry-institution links. Accordingly, the study addressed two research questions: To what extent do RPL and industry and institution linkages in CBT implementation help achieve employability? And what lessons can be drawn from international experiences to support CBT implementation in Ghana and other emerging VET institutions? The study revealed that though RPL is a powerful tool to bring people from diverse backgrounds into the formal learning system, there is an apparent difficulty among candidates to identify and articulate their own prior learning in writing and provide corresponding evidence. It requires innovative techniques, such as e-portfolio and on-line facility, to provide greater awareness and quality information to assist learners in producing work-related evidence.

Performance criteria in RPL assessment must cover situational contexts and contingency management skills to enhance flexibility and ensure an adaptable labour force in the event of changes in workplace practices. Implementing RPL to achieve the goal of social inclusion requires that the processes are carefully tailored to address the diverse background and specific needs of various client groups (Whittaker et al., 2006). It was evident from the study that the social and economic structures in Ghana are not conducive to achieving the benefits of industry and VET collaboration in the same way that developed economies' structures are. However, the formation of industry-led agencies and innovative partnerships of industry and training institutions such as developing the workplace as a learning arena through a 'combined school factory' could introduce mutual benefits, including adequate equipment and training facilities, specialised expertise, workplace training, the smooth transition of students from school to work and increased production.

7.4.2 Implementation of CBT in Ghanaian polytechnics

Chapter 4 aimed to examine the extent to which the polytechnics adapted their educational practices in the context of CBT. It specifically focused on variables such as industry and institution linkage, the use of modular structures, assessment practices, lesson delivery and performance grading as implemented in CBT. The central question was, 'To what extent are linkages between industry and polytechnics, modular structure, assessment practices and performance grading indicators of the effectiveness of CBT implementation'? Different

sets of questionnaires were administered to students and lecturers; interviews were conducted with polytechnic administrators.
The results showed that the level of understanding of CBT was consistent across management, staff and CBT students in the polytechnics. Even though the curriculum and assessment procedures undergo accreditation, monitoring and evaluation by the National Accreditation Board (NAB), National Council for Tertiary Education (NCTE) and National Board for Professional and Technician Examinations (NABPTEX), the role of industry was prominent during the internship programme. In this stage, industry provides placements and mentors students to help them achieve required competencies. Furthermore, only six of the twelve features of CBT considered in this study formed part of the implementation processes. Learners' prior knowledge and skills were not assessed for credit transfer or exemption from courses in training. These results corroborate with experiences described in Australia, the United Kingdom and The Netherlands where RPL implementation has been limited by inadequate resources, time and complex processes associated with gathering evidence about applicants.

Contrary to the principle of CBT, the selection of teaching and learning modules was performed solely by lecturers without consideration of students' inputs. For this reason, students' progression in the modules was determined by the lecturers, instead of whether each student attained mastery of a specific skill. Assessment was generally theoretical, with few practical activities, mainly due to inadequate equipment and training workshops. Grading students' performance involved both norm and criterion-referencing consistent with practices in the United Kingdom, Australia and South Africa (Arguelles and Gonczi, 2010).

7.4.3 Acquisition of professional skills in the context of CBT

Chapter 5 examined the perceived effects of CBT on the acquisition of professional skills. The main study variables were the modular structure, industry involvement and assessment practices, with quality of teachers and feedback from assessment as intermediary variables. The association of modules, industry and assessment practices, mediated by teacher quality and feedback, is based on the philosophy of CBT that almost all learners can learn equally well if they receive high quality of instruction and sufficient time (NCTVET, 2006; Smith, 2010). The central research question was, 'To what extent do features such as modular structures, involvement of industry and assessment practices, together with quality of teachers and feedback influence the acquisition of competencies required to perform professional tasks?

The results of the structural equation modelling showed a strong, significant effect of the use of modular structures on the quality of teachers as well as a strong effect on feedback. Appropriate teaching and learning modules thus promote the quality of teaching and assist teachers in providing effective feedback on students' learning. The results also show a moderate, direct effect of teacher quality on professional skills. We observed an indirect

effect of teacher quality on professional skills through feedback. Contrary to our expectations based on other studies (Waterhouse and Virgona, 2004), we found no direct or indirect effect of industry participation on the acquisition of professional skills. No relationship emerged between assessment practices and the acquisition of professional skills either.

7.4.4 Disciplinary perspectives of CBT and employability skills

Previous studies show that employability skills can be developed appropriately within specific disciplines in HEIs when teaching and learning involve more activity-oriented and student-focused activities that provide opportunities to explore creative ideas (Hager et al., 2002; Keller et al., 2010; Trigwell, 2002). Other studies report that employability skills are more developed and stimulated by sources outside HEIs, such as employers and government agencies, through industry-based learning, internships and practicum (Crebert et al, 2004). To shed more light on this long-standing debate about the sources of developing employability skills, Chapter 6 explored the implementation of five main CBT study programmes in polytechnics and their influence on the achievement of employability skills. In this regard, the study addressed a central research question: To what extents do study programme and students' background characteristics influence the achievement of employability skills in the implementation of CBT in Ghanaian polytechnics?

Hierarchical regression analyses showed that study programmes involving student-centred learning have significant effects on the acquisition of employability skills. Furthermore, we found a strong, statistically significant effect of industry training on the acquisition of employability skills, consistent with previous studies (Crebert et al., 2004). In contrast with our expectation which was based on previous findings (Van den Berg and Hofman, 2005), we found no statistically significant effect of gender on the acquisition of employability skills. That is, the results did not support that women tend to progress through their studies faster than men and thus are more likely to acquire higher levels of employability skills. However, pre-education had significant effects on employability skills even though no such evidence appeared in different study programmes. As we posited, students in vocational and technical institutes acquired higher levels of employability skills.

7.5. Discussion

This dissertation has sought to investigate the perceived effect of CBT implementation on teaching and learning processes in Ghanaian polytechnics. In this section, we take a broader perspective and discuss the main outcomes of the study in relation to teaching and learning modules, assessment and task-oriented feedback, industry participation in CBT and the acquisition of employability skills.

7.5.1 Teaching and learning modules and the use of RPL

Appropriate teaching and learning modules enhance the quality of teaching, ultimately leading to the acquisition of skills and knowledge required to perform professional tasks.

This finding provides empirical support to the principle of CBT that emphasises the use of modules to ensure mastery of tasks. Consistent with previous studies (Bell and Wades, 1993; Crossley et al., 1993; Van Eijl, 1986), modularisation enhances teachers' work by catering for more diverse student population, avoiding duplication; increasing opportunities for interdisciplinary study and helping students manage studies at their own pace. Despite this flexibility of choices, the use of modules also might bring about fragmentation in study programmes (Jenkins and Walker, 1994). It is also possible for students to choose only those modules that are relatively easy to complete, avoiding a particular type of assessment or related competencies that ultimately might be crucial for their employment prospects (Jenkins and Walker, 1994). Despite these challenges, the use of modules in different study programmes potentially brings students in contact with different pedagogical traditions, assessment practices and management-related issues. This is crucial in the emerging knowledge economy, because professional bodies attach great importance to broad educational experiences that promote the development of generic competencies necessary for successful employment.

The use of modules is also enhanced in CBT when students' relevant prior experiences are recognised, allowing them to receive exemptions or credit transfers to pursue advanced or higher-level modules in their study programmes. However, our study revealed that the CBT implementation process did not recognise students' prior learning or experiences, which represent a disincentive for skill development in that students had to repeat previous learning experiences to progress from one module to another. Although many countries and VET institutions have public policies on RPL as a useful tool for social inclusion into formal educational, its implementation has met various challenges, leading to low recognition of its qualification among HEIs (Bateman and Knight, 2002, Smith and Clayton, 2009). Key challenges are funding, assessment procedures and language problems. As an emerging VET system in Ghana, polytechnics need to identify pragmatic solutions to these challenges to be able to offer opportunities for the increasing number of junior high school and technical graduates who are learning trades provided by master craftspeople in the informal sector. A rigorous and effective RPL system requires the support of government, institutions and the business community to provide funds and materials as the process is apparently resource-intensive.

The RPL notion that learning takes place in different contexts has implications for the design of teaching and learning modules in terms of structure, delivery and assessment. To this end, polytechnics need to formally integrate various settings, such as work placement; blended learning that includes face-to-face, video-conferencing and on-line learning for on-campus and off-campus students; company-in-house training; and community practices into mainstream training programmes. Moreover, recognising individual competencies, regardless of where and how they have been acquired is a cost-effective means to upgrade skills and knowledge in the informal sector as well as a pre-condition for lifelong learning among existing workers. Thus it is crucial for institutions to provide on-line facilities that

can help applicants obtain access to support materials and gather relevant evidence to promote the widespread use of RPL. Implementing RPL in the educational system in Ghana is likely to address the needs of disadvantaged groups, part-time and mature students who seek to obtain entry into programmes by removing the artificial barriers between academic and VET systems.

7.5.2 The new roles of teachers and task-oriented feedback

The moderate effect of the quality of teachers on the acquisition of professional skills seems to suggest that teaching and learning in CBT does not match a normative framework of teaching theory, involving cognitive apprenticeships in competence-based vocational education. This theory emphasises the need for teachers to recognise the prior knowledge and experiences of students as a foundation for advanced learning; undertake teaching strategies such as modelling, coaching, scaffolding and exploration; and arrange learning materials logically to meet the diverse needs of learners with increasing complexity (Loyens et al., 2008). The aim is to ensure that students connect what they already know from the outside world with the learning situation and also become actively involved in the learning process so that they can regulate their learning at their own pace towards the completion of tasks. However, the failure of teachers to recognise students' prior learning as a cognitive framework for advanced learning and inadequate teacher support in the learning processes as demonstrated in this study suggest that teachers have not fully adopted their new roles in CBT programmes. Consistent with this finding, Seezink and Poell (2010) conclude that vocational teachers do not perform in line with normative theories for teaching and learning in CBT programmes. Thus, there is a clear need for comprehensive staff development programmes for CBT teachers, to establish long-term changes in their mindsets, belief systems, values, intentions and theories to match their new roles and tasks.

Performing new roles in CBT has rather led to many complaints among teachers, including increased workloads, complex administrative procedures and labour-intensive, and time-consuming exercises to the extent that certain roles get neglected or less emphasised (Biemans et al., 2004; Hellwig, 2006). No single teacher can fulfil all these roles in training activities which implies the need for teamwork and collaboration among colleagues from different disciplines with unique backgrounds and orientations together with workplace trainers and assessors to achieve the desired outcomes.

Students' concerns about inadequate learning support from teachers lends support to the arguments of Smith (1999) and Boahin and Hofman (2012) that the facilitating role of the teacher, large class sizes, use of second language as a medium of instruction and inadequate skills in time management have negative effects on self-paced learning in CBT. The fact that students received feedback from their teachers and yet expressed concern about inadequate learning support suggests that the kind of feedback provided in polytechnics does not contain enough task-related information or corrective guidelines for students to become confident and committed to learning at their own pace. For feedback to be

effective, grades must be accompanied by interpretations or short written comments that contain task-oriented information and corrective cues to assist students in self-regulating learning at their own pace towards the achievement of learning goals (Black and William, 1998).

7.5.3 Acquisition of employability skills

The results of the study confirmed a strong relationship between study programmes and the acquisition of employability skills in support of studies by Keller, et al (2010).This means that trainers need to determine the employability skills required to be part of their social or community practice and make these skills the focus during the creation of training programmes. The validity of employability skill assessments depend on systematic job analysis, so a bottom-up approach to the development of employability skills can identify teaching and learning strategies as well as assessment criteria required to promote appropriate employability skills in specific disciplines.

In particular, teamwork and creativity earned the highest mean scores across the employability skills for all five disciplines. These findings corroborate studies by Crebert et al. (2004) that hard-applied disciplines often involve projects that require teamwork, group discussion and collaboration. Learning to work in teams is particularly significant because it enhances the acquisition of other crucial skills such as good communication, collaboration, problem solving, conflict resolution, leadership, interpersonal relations and social and critical thinking (Hansen, 2006; Keller et al., 2010).

The findings also provide evidence of a significant relationship between pre-education and the acquisition of employability skills though this link fades away with the inclusion of different study programmes. These results suggest that students' pre-education at technical and vocational institutes relate to their study programmes and thus have significant effects on the acquisition of employability skills. This finding is particularly significant in that it is consistent with the rationale for setting up the VET system in Ghana namely, to train lower and high-level technicians as well as middle-level skilled personnel to meet the technological needs of industry and the private sector (COTVET, 2006; Ministry of Education, 1993). Graduates from technical and vocational institutes possess the fundamental skills training needed to enter polytechnic education and pursue vocational and technical, career-focused programmes in engineering, applied art, science and technology and business management (Afeti, 2005).

Unfortunately, limited academic progression occurs among graduates from the technical institutes into programmes in polytechnics education (Addy, 2008). In the past five years, NABPTEX has been organising Access course examinations yearly for graduates from the technical and vocational institutes, but it covers only 10% of the applicants who gain admission into polytechnics. Equally important is the need for a well-defined progression throughout the whole VET system in Ghana. As practised in other countries (e.g., Korea,

Japan, Singapore, The Netherlands), training pathways in the VET system should seek to prepare students with pre-technical and vocational skills at the junior or senior high school levels or TVIs. Thereafter, graduates can pursue the path of technology to polytechnics (HND) or Bachelor's (B.Tech), Masters' (M.Tech) and doctoral (D.Tech) technology degrees. The HND should not be erroneously considered a means to enter university education; technical and vocational education instead must embrace its distinct philosophy of putting more emphasis on competence in the use of technologies to solve the socio-economic needs of the society.

The effects of gender on the acquisition of employability skills did not confirm our expectation or prior findings that women progress through their studies faster and thus are more likely to achieve higher employability skills than men (Besterfield-Sacre et al., 2001; Knight et al., 2002; Van den Berg and Hofman, 2005). Possible factors such as the use of self-reports as the main instrument for information collection coupled with the low representation of women in science, engineering and mathematics programmes might have an adverse effect on the variables in the study (Virtanen and Nevgi, 2010). However, the low representation of women does not necessarily suggest structurally gendered vocational opportunities in Ghanaian VET system. Moreover, the analysis did not establish any association between male students and the achievement of employability skills. The lack of association of gender with employability skills supports Sanguinetti's (2004) contention that individuals have the ultimate responsibility to achieve the attributes and skills required by employers.

7.5.4 Industry participation in CBT

In view of its pivotal role in CBT, industry training was used consistently throughout this dissertation to evaluate the effectiveness of CBT implementation in Ghana. In contrast with our expectations and other studies (Misko, 2006; Sung et al., 2006; Waterhouse and Virgona, 2004), we found no direct or indirect effect of industry on the acquisition of professional skills. The results rather corroborate previous studies by JICA (2008) and Boahin and Hofman (2012) that imply that offering placement and supervision through practical internships constitute the main role of industry in CBT implementation in polytechnics. On the contrary, international experiences indicate considerable collaboration between industry and VET systems in the CBT implementation through the formation of industry-led agencies that provide information about industry trends and future skill needs in the contemporary workplace.

The world of work keeps changing due to changes in science and technology which means that industry's role in CBT implementation demands continual adaptation. It is imperative for industry to engage in innovative forms of collaboration to improve linkages between VET systems and industry. Most industries in Ghana tend to be medium and small scale, making it difficult to offer adequate internship placements for students. Therefore, developing the workplace as a learning arena provides opportunities for both students and lecturers to engage in real-life practical training through models of collaboration such as

'training by order' or combined production units (i.e., the enterprise engages in school management through funding, equipment and specialised teachers; the institution develops curriculum, training programmes and specialised courses to meet the training objectives of the enterprise). These workplaces, enterprises or factories provide learning sites for students and lecturers to exercise their skills in meaningful and productive jobs. Thus, training institutions might be run by relevant companies like mining, railways, agricultural cooperatives, architecture and construction firms, commerce entities, garment factories, tourism agencies, or electronic industries. While the polytechnic institutions benefit from equipment and learning facilities, specialised expertise and workplace training, industry gains through industry-demand driven form of training, smooth transition of students from school to work, lifelong learning among workers, advancements in technology and increased production.

Strangely enough, no significant association was found between industry and the achievement of competence in most chapters, but Chapter 6 showed a significant relationship between industry training and the achievement of employability skills. A logical explanation is that in the previous chapters, industry participation was examined in light of its expected roles such as the development of competency standards, identification of essential job skills, apprenticeship training and assessment of projects. In Chapter 6 however, industry participation in relation to employability skills was assessed mainly on the basis of internship training. Chapter 6 thus, provides empirical support for the previous claims by students that the dominant role of industry in their training programmes occurs during their internship (Boahin and Hofman, 2012).

Merely engaging students in internship programmes without the cooperation of both workplace trainers and teachers cannot achieve the goal of transferring learning experiences from the school to the workplace though. This point is particularly crucial, because this study showed that students' placements on internship in most cases were not related to their study programmes. This finding undermines the philosophy of industrial attachment programmes which emphasise application and transfers of theories to real-world settings.

7.5.5 Assessment and grading

Students' expressions of concern about the lack of grading and the use of both norm and criterion forms in chapter 4 might imply a means of discouraging the pursuit of excellence in CBT. The debate about the principle of non-grading in CBT reflects the premise that the outcome of training may be specified in a single performance criterion that can be demonstrated (competent) or not (not yet competent) (Allais, 2003; Mulcahy and James, 2000). In a fast changing, technologically oriented world, specifying a single criterion in assessments restricts assessors' judgment and limits the successful and effective participation of students in a wider range of job settings. As global economics change, so do workplace operations which imply that assessment criteria must be broadened to cover not only the current job-based competencies but also future skill needs and innovations.

Rapid changes in technology and workplace operations also require assessments that can reflect generic competencies so that individuals can adapt to diverse job settings and meet future skill needs of the industry.

Assessment in whatever form aims to provide information to support decisions about the quality of teaching, motivation, rewards, selection and promotions. In this regard, the decision by CBT practitioners about whether to grade must be considered in the context of the assessment, the purpose of the grading, benefits to stakeholders and whether or not the content of the assessment lends itself to clear levels of performances. Assessors must realize that individual performance differs from one context to another. Therefore, CBT assessors should collect and analyse sufficient evidence from a wide range of contexts to achieve valid and reliable assessment results.

Consistently, we did not observe direct or indirect effects of assessment practices on the acquisition of professional skills. This confirms the study by Wesselink (2010) that most assessors believe their role is to assess students' level of proficiency or achievement of grades without further interpretation (Hattie, 2009). In contrast, assessors' roles in CBT entail not only 'assessment of learning' (i.e., summative assessment) but also 'assessment for learning' (i.e., formative assessment) to evaluate, diagnose and provide task-oriented feedback and strategies to encourage students to self-regulate their learning and thus close the gap between intent and effect (Hattie and Timperly, 2007). Outcomes and interpretations of the assessment thus must involve short, written comments and corrective advice to address how and what students understand and misunderstand, along with directions and cues to improve processes that can lead to the achievement of learning goals (Black and William, 1998; Harlen and Crick, 2003; Hattie and Timperley, 2007).

7.6 Implications for educational practice

As a first major evaluative study of the implementation of CBT in Ghanaian polytechnics, the findings of this dissertation have crucial implications for educational practices in HEIs and practitioners in emerging VET systems. The positive relationship between teaching modules and quality of teaching, which ultimately enhances professional performance (Chapter 4), requires all stakeholders (students, teachers, industry personnel) to take part in preparing modules to achieve the desired results. When students recognise that their training is closely linked with their future professional practice, learning becomes more meaningful. Moreover, industry and training institutions' networks can use modules to offer opportunities to people who have acquired specific competencies through their previous training, work or life experience in informal sectors. To this end, applicants could obtain qualifications for credit transfer or exemptions after completing a module.

Although the use of modules allows students enough freedom to manage their own pace of learning in CBT (Betts and Smith, 1998), teachers must implement some measures to check abuses of this flexibility. To ensure potential benefits in terms of the competencies needed to perform professional tasks and coherence in study programmes, students' selection of

modules should be regulated. Modules might be organised into core and compulsory, or requirement for entry into advanced modules, distinct from other modules as well as oversights to ensure that students' preferred modules receive approval from an academic board.

Regarding students' concerns as detailed in chapter 5 about inadequate learning support from teachers, we suggest the need for teachers to recognise the individual differences among their students. That is, students are expected to take charge of their studies and learn at their own pace in preparation for a workplace culture, but teachers must provide opportunities for regular interaction with students throughout the training process. An interactive learning environment with sufficient student support and tailored scaffolding encourages students to self-regulate their learning and leads to greater achievement and persistence (Kift, 2009). Students must be the focal point of competence development, for that reason, all learning activities should be adjusted to facilitate individual learning trajectories rather than group-based or teacher-centred learning as in the case of traditional programmes (Jonnaert et al., 2007; Wesselink, 2010). Inadequate learning support may also relate to the ineffectiveness of teachers' feedback in reducing the discrepancies between students' current understanding or performance and their desired goal attainment.

Competency-based training is about skill performance, which implies that teachers' feedback on assessment tasks must provide information about the tasks, processes or strategies needed to understand the tasks, as well as commitment to directing, monitoring and regulating activities toward the completion of the task. Therefore, the emphasis on grades or marks in CBT must be reduced because they contain little task-related information or commitment to learning goals (Hattie and Timperley, 2007).

The conceptual model in Chapter 5 reveals that the achievement of required skills and attitudes, and thus the successful implementation of CBT, depends largely on teacher expertise and pedagogical skills. If teachers are to perform as experts, coaches and learning managers, they must undertake a paradigm shift in their own mindsets in terms of their belief systems, values, intentions, instructional methods and didactics. It also implies that teachers must be willing and prepared to integrate normative theories of teaching and learning in their educational practices. In real-life classroom settings, the roles that teachers will need to perform often remain unpredictable and the circumstances and opportunities for performing certain roles cannot be repeated on demand by CBT teachers. For this reason, Fullan (1991) proposes that every educational innovation must be regarded as a journey, not a blueprint to be implemented step-by-step. Conflicts and challenges are essential part of every innovation, including CBT. Therefore, teachers and other stakeholders need to improvise and customise some principles, ideas and structures in local conditions, to achieve a sense of ownership and the expected outcomes.

The role of teachers as transformative agents (Pennycook, 2001) also means that they must ensure their own continual professional growth. Beyond meeting institutional demands for professional development, teachers may undertake periodic, part-time internships or

workplace training to acquaint themselves with current and future workplace operations and professional practices. Teachers with workplace experience or who work on a part-time basis as a professional in an enterprise have the most current workplace experiences (Lohman, 2006; Seezink, 2009; Wesselink, 2010).

The strong influence of study programmes on the acquisition of employability skills as revealed in Chapter 6, stresses the need for teachers to make careful decisions about the kind of learning activities they use in the delivery and assessment of competency. Potential activities include role playing, simulations, team and group projects, brainstorming, developing action plans and portfolios and problem-solving tools depending on the kind of employability skill(s) to be acquired. Employability skills manifest in different, authentic contexts (Green et al., 2009; Lave and Wenger, 1991), so a wide range of settings including direct interaction, video conferencing, on-line and workplace learning must be provided for learners to experience and apply their relevant skills.

Providing relevant activities, opportunities and resources in authentic or simulated environments also encourage learners to develop adult learning principles such as responsible (taking ownership of the learning process), experiential ('learning to do' and 'learning from doing'), cooperative (sharing learning tasks and learning from a wide range of people) and reflective (developing critical thinking and appraising learning experiences to turn into lessons for the future) learning (Cleary et al., 2006;Gulikers, 2006). Acquiring and developing such learning principles constitute core outcomes of higher education as well as a basis for successful employment, social adjustment and lifelong learning.

7.7. Strengths and limitations

This dissertation has several strengths. It included a broad range of variables crucial for the successful implementation of CBT in the Ghanaian context. Even though not all the features of CBT were examined closely, those considered in the study were significant because they related to the achievement of employability, which is the focus of CBT in Ghana.

Furthermore, the study describes various experiences and approaches to CBT in different countries, which reveals the various roles of government in terms of funding, regulating, managing, certifying and relationship with industry and training providers. Thus policy makers and emerging VET systems gain a broader overview of key directions, issues and innovative structures, as well as their effectiveness for skill formation and attendant challenges towards achievement of employability in CBT implementation. This study also provides useful information for other polytechnic study programmes that seek to redesign their curricula towards competency-based system.

This dissertation attempts to examine the mediating effects of teacher quality and feedback on the acquisition of professional skills. Essentially, it focused on the quality of instruction and the nature of feedback information as logical connections between teaching modules

and the achievement of learning goals in CBT. The results reveal that the use of modules is effective for the acquisition of professional skills only through the mediating role of quality of instruction and task-oriented feedback.

In this study, we examined the implementation of CBT in relation to the achievement of generic or employability skills rather than acquisition of technical or job-specific skills. Both Chapters 5 and 6 examined the effect of CBT implementation on the acquisition of employability skills along the perspectives of study programmes or utilisation of key features. This approach is particularly significant because rapid economic and technological changes compel industries and enterprises to change their operations continually. To remain competitive in the labour market, workers no longer require just job-specific skills but also employable skills to continually develop, adapt, upgrade and transfer skills across job settings.

A number of limitations however, must be taken into account regarding the interpretations of the findings in this dissertation. In view of the unique VET systems across the different countries considered in the dissertation, it was impossible to specify the best international CBT practices. A comparative study in Chapter 3 revealed not necessarily best practices but rather trends and innovative structures in international experiences to suggest directions for CBT in Ghana. Trends often are influenced by economic, political or ideological cycles and the stages of economic development during a period under review.
Another limitation is the use of a cross-sectional design with different respondents across two measurements. Participants in the second study consisted of first-, second-, and third-year CBT students only, because the non-CBT system in all the study programmes under review had been phased out, which made it impossible to conduct a longitudinal study with all participants because the non-CBT students simply were not available for participation. Closely related to above is that the comparative study of the first and second year CBT students with the third year non-CBT students in the baseline study may not provide accurate results as the latter group of students may have more experience and exposure from long period of studies and industrial attachment programmes.

Evaluating the effectiveness of a curriculum innovation such as CBT requires a longitudinal study, with repeated measures of the same variables offered by the same group of participants over an extended period of time. Such a design could avoid the limitations of cross-sectional studies that involve different groups of respondents and reliance on participants' recall of past events (Robson, 2002). As CBT is a practical-oriented form of learning, direct observations of participants' behaviours and attitude required to perform a professional task in a simulated environment or natural settings could minimise the potential biases associated with self-report questionnaires and enhance the validity and accuracy of the responses. Furthermore, both studies particularly industry involvement dimension in CBT implementation suffered from very low reliability index. Readers are therefore advised to be very careful in the generalisation of the findings.

Finally, this dissertation focused mainly on disciplines in the hard-applied courses (e.g., engineering), which might lead to the erroneous impression that CBT can be implemented only within engineering programmes. Even though all the piloted CBT programmes were engineering-based, the CBT curriculum can apply in all categories of academic disciplines. Furthermore, the engineering-oriented study programmes used in this dissertation led to the inclusion of fewer female students. Studies show that women often are underrepresented in disciplines such as science, engineering and mathematics, even though their relevant abilities are not different from men's (Virtanen and Nevgi, 2010). The low representation of women in this study might affect the potential effects of gender on the acquisition of employability skills.

7.8 Recommendations for further research

The dissertation has focused primarily on the effect of CBT implementation on teaching and learning processes in polytechnic education in Ghana. In prior literature, CBT reforms in various countries stem from global economics and technological changes, which compelled training institutions to focus more on the needs of industry (Mulcahy and James, 2000; Smith, 2010). Assessments of the labour market performance of graduates from CBT programmes thus might produce useful information for stakeholders. Therefore, an evaluation of CBT within enterprises to investigate the extent to which CBT meets the requirements of other stakeholders (e.g., industry, employers, and workers) would be a valuable extension of the present research.

Enterprise surveys and daily newspaper advertisements from employers show increasing interest in generic competencies (Blakes et al., 2012; Guthrie, 2009; Ofsted, 2011). For example, a Confederation of British Industry (2010) survey showed that employers do not anticipate everyone arriving 'job ready' but do expect young people with good employability skills, including problem solving, team work and time management skills.

This trend is particularly crucial in view of the compelling demand for industries and enterprises to continually change their operations to remain competitive. Even though the studies in Chapters 5 and 6 focused on the achievement of employability skills, the assessment of these competencies was beyond the scope of this dissertation. Thus concerns remain that employability skills are poorly developed, taught and assessed in VET institutions (NCVER, 2003; NCTVET, 2006). An interesting focus for further research thus might be an investigation of the teaching and assessment of employability skills in Ghanaian polytechnics.

All the study programmes considered in this dissertation were engineering-based, reflecting the focus of the piloted CBT programmes in polytechnics. As other study programmes in the polytechnics are being redesigned towards competency-based system, it is imperative to gather further information about the achievement of employability skills through non-engineering programmes. Other studies have shown that employability skills can be promoted by sources outside HEIs, such as employers and government agencies (Lave and

Wenger, 1991). Furthermore, a debate continues about the transferable nature of employability skills across contexts and whether they are relevant mainly to vocational training (Moore and Hough, 2005). Considering this debate, is it possible that employability skills simply do not need to be taught in HEIs? Are employability skills promoted in academic settings different from those required by the world of work? Are employability skills better developed by general education or specific disciplines? And which disciplines lend themselves better to the development of employability skills? These and many other questions remain for further research that can shed more light on the foregoing issues.

The implementation of CBT is only as effective as the utilisation of its features. In view of our focus on employability, this dissertation has primarily explored variables such as modular structure, industry training, assessment practices and RPL (Chapters 4 and 5). The results of these studies reveal only partial utilisation of these features, implying that Ghanaian polytechnics have not attained the level of CBT required by government VET policy imperatives. Additional studies might investigate the implementation of a full range of CBT features, consistent with the policy imperatives of the government. It is also known from previous studies that certain study programmes tend to adopt specific features to suit the needs of particular programmes or clients and ignore other features (Smith, 1999). Therefore, studies on the implementation of CBT features could be performed to reflect the perspectives of each study programme.

Finally, we examined the perceived effect of CBT implementation in Ghanaian polytechnics using a cross-sectional design. A more in-depth examination should consider skills, knowledge and applications over a period of training to obtain clearer perspectives on participants' experiences. Further research into the effectiveness of CBT implementation could focus on improvement of the instruments used in the study and use of longitudinal approaches with just a few polytechnics. Such studies could collect data from a cohort of participants, measuring the same variables over time, to determine the causal relationships among variables, behaviours and attitudes. For example, repeated measures of students' pre-education, gender or study programmes might provide more insightful outcomes than one-shot measure.

References

Aamodt, P. & Havnes, A. (2008). Factors affecting professional job mastery: Quality of study or work experience? *Quality in Higher Education*, 14 (3), 233-248

Addy, M.E. (2008). Educational Reforms and the Sciences, *Legon Observer*, 2(1), 14-18

Afeti, G. (2005). Strategic institutional development in the South. A case study of Ho Polytechnic, Ghana. NUFFIC Conference 'A Changing Landscape' The Hague, 23-25 May, 2005.

Allais, S. M. (2003). The National Qualifications Framework in South Africa: a democratic project trapped in a neo-liberal paradigm? *R. A. U Sociology*. Development studies Seminar Room (506).

Andrews, J. & H. Higson. (2008). Graduate employability, soft skills versus hard business knowledge: A European study. *Higher Education in Europe,* 33 (4), 411-422.

Annan, K. (2000). Information technology should be used to tap knowledge from greatest universities to bring learning to all. Press release: No UNIS/ SG/ 2625. Available at http://www.univienna. Org/unis/pressrels/2000/sg2625.html

Argüelles, A. & Gonczi, A. (2000). *Competency-based Education and Training: a world perspective.* (Conalep, Mexico).

Association of African Universities (AAU) (2011). Strengthening African higher education through the dissemination of research content: the role of the library, Stellenbosch, South Africa.

Australian Chamber of Commerce and Industry & Business Council of Australia (ACCI/BCA). (2002). Employability skills for the future, Department of Education, Science and Training, Canberra.

Australian National Training Authority (ANTA) (2003). What makes for good workplace learning? At a glance.

Baartman, L. K. J., Bastiaens T.J., Kirschner, A. P. & Van der Vleuten, C.P.M. (2006). The wheel of competency assessment. Presenting quality criteria for Competency Assessment Programmes. *Studies in Educational Evaluation*, 32, 153–177.

Baffour-Awuah, D. & Thompson, S. (2011). *A Holistic Approach to Technical and Vocational Skills Development (TVSD) Policy and Governance Reform: The Case of Ghana*. Triennale on Education and Training in Africa, Ouagadougou, Burkina Faso.

Bagshaw, M. (1997). Employability—creating a contract of mutual investment. *Industrial and Commercial Training,* 27 (6), 187- 189.

Barkham, J., & Elender, F. (1998). Applying person-centred principles to teaching large classes, *British Journal of Guidance and Counselling,* 23 (2), 179-97.

Barrie, S. (2005). *Rethinking generic graduate attributes.* HERDSA News, University of Sydney, Australia.

Bateman, A. & Knight, B. (2002). *Giving credit: A review of RPL and credit transfer in the vocational education and training sector*, 1995 to 2000. Adelaide

Bell, G.H. & Wade, W. (1993). Modular course design in Britain: Some problems, issues and opportunities. *Journal of Further Education,* 17: 3-12

Bertrand, O. (1998) *Trends and issues in Vocational Education and Training: A perspective from Europe.* Available at: http://www.oei.org.co/ibefop/mexico4.htm. Accessed March 13, 2012

Besterfield-Sacre, M., M. Moreno, l. J. Shuman, & C. J. Atman. (2001). Gender and ethnicity differences in freshmen engineering student attitudes: A cross-institutional study. *Journal of Engineering Education,* 90, 477-489.

Betts, M., & Smith, R. (1998). *Developing the credit-based modular curriculum in higher education*. London: Falmer Press.

Biemans, H., Nieuwenhuis, L.R., Poell, M., Mulder, M. & Wesselink, R. (2004). Competency-Based VET in The Netherlands: Backgrounds and pitfalls. *Journal of Vocational Education and Training,* 56 (4), 523 -538.

Billett, S, McKavanagh, C, Beven, F, Hayes, S, Angus, L. Seddon, T, Gough, J, & Robertson, I. (1999). The CBT decade: Teaching for flexibility and adaptability, NCVER, Adelaide.

Black, P., & William, D. (1998). Assessment and classroom learning. *Assessment in Education* 5 (1), 7-74.

Blakes, R; Fauth, B. & Gibb, J. (2012).Measuring employability skills: A rapid review to inform development of tools for project development. http://www.ncb.org.uk/media/579980. Accessed July 31, 2013.

Blom, K., Clayton, B., Bateman, A., Bedggood, M. & Hughes, E. (2004). RPL in enterprise-based RTOs: How does it work? Paper presented at 7th Annual AVERTRA Conference, Canberra 17-19 March 2004. http://www.avetra.org.au/ConferenceArchives/2004/documents/PA057Bedggood. Accessed February 12, 2012.

Bloom, E. Canning, D. & Chan, K. (2006a). Higher Education and Economic Development World Bank working Paper 102, Africa Human Development Series,Washington, DC.

Boahin, P. & Hofman, W.H.A. (2012). Implementation of Innovation in higher education: the case of competency-based training in Ghana. *Innovations in Education Teaching International,* 49 (3), 313-323

Boahin, P., Kamphorst, J.C. & Hofman. W.H.A. (2010). *Tracer study on the performance of polytechnic graduates in Ghanaian labour market*. Accra, Ghana.

Boateng, K., & Sarpong. E. (2002). An analytical study of the labour market for graduates in Ghana. *World Bank/National Council for Tertiary Education Project*. Accra.

Boreham, N. (2002). Work process knowledge, curriculum control and work-based route to vocational qualifications. In: *British Journal of Educational Studies,* 50 (2), 225-237.

Bowden, J., & Masters, G. (1993). *Implications for Higher Education of a Competency-based Approach to Education and Training*, AGPS, Canberra.

Brewer, J.D & Tierney, W.G. (2010). *Barriers to Innovation in U.S. Higher Education.* University of Southern California, USA.

Brockmann, M., Clarke, L. Mèhout, T. & Winch. C. (2008). Competence-based vocational education and training (TVET): the cases of England and France in a European perspective. *Vocations and Learning,* 1(3), 227-244

Brown, P., Lauder, H. & Ashton, D. (2008). Education, Globalisation and the Future of the Knowledge Economy. *Europeans Educational Research Journal*, 7 (2), 131-156

Callan, V. & Ashworth, P. (2004). *Working together: Industry and VET provider training partnerships.* Australian National Training Authority, Adelaide, Australia.

Carter, S. D. (2005). The growth of supply and demand of occupational-based training and certification in the United States, 1990-2003. *Human Resource Development Quarterly,* 16 (1), 33-54.

CEDEFOP (European Centre for the development of vocational training) 2010. *The development of national qualification frameworks in Europe*. Luxembourg: Publications Office of the European Union.

Chappell, C., Gonczi, A., & Hager, P. (1995). Competency-based education, In G. Foley (Ed.), *Understanding adult education and training* (pp. 175-187). Sydney: Allen & Unwin.

Cheetham, G. & Chivers, G., (1996). Towards a holistic model of professional competence. *Journal of European Industrial Training,* 20 (5) 20-30.

Clarke, L. & Winch, C. (2006). A European skills framework – but what are skills? Anglo-Saxon versus German concepts. *Journal of Education and Work,* 19(3), 255-269.

Cleary, M., Flynn, R. & Thompson, S. (2006). *Employability Skills. From Framework to Practice*. Melbourne, Australia.

Collins, A., Brown, J.S. & Newman, S. E. (1989). Cognitive apprenticeship: teaching the crafts of reading, writing, in Resnick, L.B. (Ed.), *Knowing, Learning and instruction: Essays in Honour of Robert Glaser*, Lawrence Erbaum, Hillsdale, NJ

Confederation of British Industry (2010). Ready to grow: business priorities for education and skills. Education and skill survey 2010, London, CBI.

Conford, I. R. (2001). Competency-based training: evidence of a failed policy in training reform. *Australian Journal of Education*, 44, 135 -154.

Cornford, I. R. (1997). Ensuring effective learning from modular courses: a cognitive, Journal of Vocational Education and Training*,* 49 (2), 237-251.

COTVET Preparatory Technical Committee (CPTC) November, (2006). Accra, Ghana.

Crebert, G., Bates, M., Bell, B., Patrick, C. & Cragnolini, V. (2004). Developing generic skills at university, during work placement and in employment: Graduates' perceptions. *Higher Education Research and Development*, 23(2), 147- 165.

Cremers, P., Eggink, J. & Hoetink. F. (2005). *Competency-based training: Curriculum (re)design beyond the hype.* Hanze University, Groningen, The Netherlands.

Crossley, M., Clarke, G., Tabi, T. & Thomas, H. (1993). Implementing the process of modularization in higher education. Some trans-national issues. *Higher Education Quarterly,* 47, 334-56

Cuddy,N. and Leney, T. (2005). Vocational Education and Training in the UK. Short description. Panorama, Greece

Curtain, R. (2004). *Vocational educational and Training, innovation and globalisation.* Adelaide: National Centre for Vocational Education Research (NCVER).

del Bueno, D. J. (1978). Competency-Based Education. *Nurse Educator*, 3(3), 10 -14.

DEEWER (Department of Education, Employment, and Workplace Relations) (2007). *The training package development handbook for units of competency,* Available online at: http://www.tpdh.deewr.gov.an/units_of__competency/default.htm.Accessed November 12, 2012.

Deissinger, T., Hellwig, S. 2011. *Structures and Functions of Competency-based Education and Training* (CBET): a comparative perspective, Mannheim, Germany.

Department of Education and Labour, (2003). Good Employee practices are good for your business: Becoming an employer of choice*,* New Zealand.

Department of Education, Science and Training. (2005). The Australian Quality Framework; Standards for registered organisations, and standards for registering and accreditation bodies, Canberra. DEST.

Desai, R. (2006). The Review of Innovative National Vocational Qualification (NVQ) Assessment techniques. The Research Centre, NORWICH.

Descy, P. & Tessaring, M. (2002). Training and Learning for competence. Second report on vocational training in Europe: Executive summary, Luxemburg, CEDEFOP.

DEEWER (Department of Education, Employment, and Workplace Relations) (2007). *The training package development handbook for units of competency,* Available online at: http://www.tpdh.deewr.gov.an/units_of _competency/default.htm.Accesed November 12, 2012.

Doudu, A. (2006). *Technical and Vocational Education and Training in Ghana*. A case study. Accra, Ghana.

Drucker, P. (1993). *Post-Capitalist Society.* Oxford, Butterworth-Heinemann.

Dubois, D., & Rothwell, W. (2004). Competency-based human resource management, Oxford, UK: Davis-Black.

Eggink, J. & Van Den Werf, E. (2006). *Higher education in the Netherlands. The systems, institutions and degrees.* (NUFFIC), August, 2005).

Ely, D. P. (1999). *New perspectives in the implementation of educational technology innovation.*

Field, l. (2000). Organisational Learning: Basic Concepts in G. Foley (eds.), *Understanding Adult Education and Training.* 2nd ed. St. Leonards, NSW: Allen & Unwin.

Figgis, J. (2009). *Regenerating the land of professional VET practice: Practitioner–driven changes to teaching and learning*, NCVER, Adelaide

Foot, S. & Megginson, D. (1996). Competence-based vocational training: ten years on and still down the wrong path? *Education+ Training,* 38 (3), 17-27.

Freitag, W.K. (2007). Permeability in education, vocational training and further education - the key to lifelong learning. *Federal Ministry of education and research*. Munich.

Fullan, M. (1991). *The meaning of educational change.* New York: Teachers College Press

Fullan, M. (2007). *The new meaning of educational change* (4th ed.). New York. Teachers College Press.

Fullan, M. (2008). *The six secrets of change.* San Francisco*:* Jossey-Bass

Garnett, J., Portwood, D. & Costley, C. (2004). Bridging Rhetoric and Reality: Accreditation of Prior Experiential Learning (APEL) in the UK. University Vocational Award Council. Available online at: http://www.uvac.ac.uk/wp-content/uploads/2010/08/APELReport-FINAL1. Accessed January 17, 2013.

Gauld, D & Miller, P. (2004). The qualifications and competencies held by effective workplace trainers. Journal of European Industrial Training, 28(1), 9-22.

Ghana (BBTec) Bachelor of Building Technology Programme at the Cape Coast and Sunyani Polytechnics. (2007). NPT/Gha/047 Proposal BBTec Building Technology. Accra, Ghana.

Ghana Fashion Design Education. (2007). Building Capacity at Accra Polytechnic to strengthen Fashion Design. Accra, Ghana.

Ghana MESC (Ministry of Education, Sports and Culture), (2004). Design and Technology (Years 9–13) Samoa Secondary School Curriculum. http://www.mesc.gov.ws/pdf/Design Tech_wk.pdf. Accessed January 23, 2013.

Ghana MOESS (Ministry of Education, Science and Sports) (2008). Preliminary Education Sector Performance Report (ESPR). Accra, Ghana.

Gibb, J. (2004). Generic skills in vocational education and training NCVER, Adelaide. http://www.ncver.edu.au/publications/1448.html. Accessed February 29, 2012.

Gibb, J. & Curtain, P. (2004). Generic skills in vocational education and training. In *Research readings,* ed. J Gibb, NCVER, Adelaide.

Gibbs, P.T. (2000). Isn't higher education employability. *Journal of Vocational Education and Training* 52 (4), 559-571

Gipps, C.V. (1994). Quality in teacher assessment. In W. Harlen, (ed.), Enhancing quality in assessment. London: Paul Chapman publishing

Glover, D., Law, S. & Youngman, A. (2002). Graduateness and employability: Students' perception of the personal outcomes of university education. *Research in Post-Compulsory Education* 7 (3), 293-306.

Gonczi, A. (1996). Reconceptualising competency-based education and training. University of Technology, Sydney.

Gonczi, A. (1999). 'Competency-based learning: A dubious past- An assured future' in *Understanding Learning at work*, eds Boud & J. Garrick, Routeledge, London.

Green, W., Hammer, S. & Star. C. (2009). Facing up to the challenge: Why is it so hard to develop graduate attributes? *Higher Education Research & Development,* 28 (1), 17-29.

Griffiths, T. & Gulie, D. (2003). A Connective model for learning: the implications for work process knowledge, *European Educational Research Journal*, 2(1), 56-73

Gulikers, J. T.M. (2006). *Authenticity is the eye of the beholder. Beliefs and perceptions of authentic assessment*. Unpublished doctoral dissertation, (Open University, The Netherlands).

Guthrie, H. (2009). *Competence and competency-based training: What the literacy says.* NCVER, Adelaide.

Hager, P. (1995). Competency standards - a help or a hindrance? Australian perspectives. *Journal of Vocational Education and Training,* 47, 141-151.

Hager, P. (2004). The conceptualization and measurement of learning at work, in Rainbird, H., Fuller, A. & Munro, A. (eds.) 2004. Workplace learning in context, London & New York: Routledge.

Hager, P., S. Holland, S. & Beckett. D. (2002). *Enhancing the learning and employability of graduates: The role of generic skills*. Melbourne.

Haimson, J. & Hulsey, L. (1999). Making joint Commitments: Roles of school, employers, and students in implementing national skill standards. (MPR Reference No.8466-400) .Princeton, NJ: Mathematica Policy Research Inc.

Hansen, R.S. (2006). Benefits and problems with student teams: suggestions for improving team projects. *Journal of Education and Business* September/October: 11-9

Hanushek, E. A. & Woessmann, L. (2007).'The Role of Education quality in Economic Growth' World Bank Policy Research Working Paper 4122, World Bank, Washington, DC.

Harlen, W. & Crick, R.D. (2003). Testing and motivation for learning. Assessment. London: Kogan Page.

Harris, J. (2000). *Prior learning. Theories of learning and the recognition of prior learning. Implications for South Africa education and training*. National Centre for Curriculum Research and Development research report, March 2000.

Harris, J. (2006). Introduction and overview of chapters . *In Re-theorising the recognition of prior learning* ed. P. Anderson and J. Harris, 1-29, Leicester: NIACE

Harris, R., Guthrie , H, Hobert, B, & Lundberg, D. (1995). *Competency-based education and training. Between a rock and a whirlpool,* Macmillan, Melbourne.

Harris, R. & Simons, M. (1999). Quality Vocational Education and Training: Where does staff development fit? *AVETRA conference papers,* University of South Africa.

Harvey, L. (2001). Developing and measuring employability. *Quality in Higher Education,*7, 97-109.

Hattie, J. (2009). The Black Box of Tertiary Assessment: An impending revolution. Tertiary Assessment and Higher Education Student Outcomes: Policy, practice and research (pp.259-275) Wellington, New Zealand: Ako Aotearoa.

Hattie, J. & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77 (1), 81-112

Hellwig, S. (2006). Competency-based training: different perceptions in Australia and Germany. *Australian Journal of Adult Learning,* 46 (1), 51-74.

Hennessy, E., Hernandez, R., Kieran, P. & MacLoughlin, H. (2010). Teaching and learning across disciplines: student and staff experiences in a newly modularised system. Teaching in Higher Education, 15 (6), 675-689.

Hillier, Y. (2009). Innovation in teaching and learning in vocational education and training: International perspectives. NCVER, Adelaide, Australia.

Hodge, S. (2007). The origins of competency-based training. *Australian Journal of Adult Learning,* 47 (2), 179-209.

Hofmann, T. (1999). The meanings of competency. Journal of European Industrial Training, 47 (6), 275- 286.

Holliday, R. (1995). S.P.A.C.E.- A model of teacher learning. Paper presented at the Paper presented at the Australian Association for Research in Education 25th Annual Conference, 26-30 November, Hobart, Tasmania.

Horton, S. (2000). Introduction—the competency movement: its origins and impact on the public sector, *International Journal of Public Sector Management*, 13(4), 306-318

Hughes, M. & Stoner. F. (2001). *Understanding and sustaining employability, Conference version*. London: Learning and Skills Development Agency.

Irving, G. (2002). Personal email communication 23 August, 2002, Deputy Principal.

James, P. (2001). The double edge of competency training: contradictory discourses and lived experience. *Journal of Vocational Education and Training* 53 (2), 301– 324.

Japan International Cooperation Agency. (2007). *Technical and Vocational Education and Training Support projects (TVETS)*. Accra, Ghana.

Jenkins, A. & Walker, L. (1994). Introduction. In developing student capability through modular courses, ed. A. Jenkins and L. Walker, 19-23, London: Kogan page.

JICA (2008). Report of Baseline survey of competency-based Training: Technical and Vocational Education and Training Support Project, Accra, Ghana.

JICA (2001). Development of a master plan to strengthen technical education in Ghana. Ghana, Accra.

Jonnaert, P., Masciotra, D., Barrette, J., Morel, D. & Mane, Y. (2007). From competence in the curriculum competence in action, *Prospects*, XXXVII (2),187 – 203.

Joosten-Ten Brinke, D., Sluijsmans, D. M. A., Brand-Gruwel, S. & Jochems, W.M.G. (2008). The quality and procedures to assess and credit prior learning: Implications for the design. *Educational Research Review*, 3, 51-65

Jörescog, K. G., D. Sörbom. (2002). Liseral 7: A guide to the program and applications. Chicago: SPSS Inc.

Jossberger, H., Brand-Gruwel, S., Boshuizen, H. & van de Weil. M. (2010). The challenge of self-directed and self-regulated learning in vocational education: a theoretical analysis and synthesis of requirements. *Journal of Vocational Education and Training* 62 (4), 415-440

Kearns, P. (2000). *Generic skills for the new economy. A review of research relating to generic skills,* Adelaide: NCVER

Kearns, P. (2001). Generic Skills for the New Economy, N CVER, Australia.

Keating, J. (2008). Current Vocational Education and Training Strategies and Responsiveness to Emerging Skills Shortages*,* A Well-skilled Future –Tailoring VET to the Emerging Labour Market, Adelaide. NCVER

Keating, J., Medrich, E., Volkoff, V. & Perry J. (2002). *Comparative study of vocational education and training systems,* (NCVER, Australia)

Keep, E. (2000). The uses of vocational qualifications by employers and government in Britain. Presentation to a conference on the certification of Vocational Qualifications in France and United Kingdom, Marseilles, March 2000.

Keller, S., Chan, C. & Parker. C. (2010). Research and development in higher education: Reshaping higher education. Vol. 33. HERDSA Annual International Conference 6-9 July, 2010. Melbourne, Australia.

Kift, S. (2009). *Articulating a transition pedagogy to scaffold and enhance the first year student learning experience in Australia higher education. Final Report for ALTC Senior fellowship program.* Australian Learning and Research Council.

King, K. (2009). Education, skills, sustainability and growth: Complex relations. International Journal of Educational Development,29 (2009) 175-181

Kizilan, F., Hamzah, R. & Bakar, R. (2009). Employability skills among the students of technical and vocational training centres in Malaysia. *European Journal of Social Sciences,* 9 (1), 147-158.

Kluger, A.N. & DeNisi, A. (1998). Feedback interventions: Towards the understanding of a double-edge sword. Current Directions in Psychological Science, 7, 67-72.

Knight, B. (2006). Assessment for recognition of prior learning in technical and vocational education and training in Australia: Where to from here? NCVER. http://www.iaea.info/documents/paper_1162a17210.pdf. Accessed January 29, 2013.

Knight, P.T and M. Yorke. (2003). *Assessment, learning and employability*. Maidenhead: Society for Research into Education and Open University Press.

Knight, W.D., Sullivan, F.J., Poole, J.S. & Carlson. E. L. (2002). Skills assessment in hands-on learning and implications for gender differences in engineering education. *Proceedings of the 2002 American Society for Engineering Education Annual Conference.*

Kodiappan, R. (2011). Challenges affecting the integration of competency-based training at the higher levels of the Singapore Workforce Skills Qualifications-National Qualification Framework. https://www.ial.ed.edu.sg/files/documents/319/challenges. Accessed 22 January 2013.

Kouwenhoven, G.W. (2003). *Designing for competence: towards a competence-based curriculum for the faculty of Education of the Eduardo Mondlane University*: Doctoral dissertation. Enschede: Twente University

Kouwenhoven, W. (2009). *Competence-based curriculum development in Higher Education: a globalised concept*. VU University Amsterdam, The Netherlands.

Kouwenhoven, W. (2011). Competence-based curriculum development in Higher Education: some African experiences. Technology, Education and Development, pp. 125-146.

Krishnan, A. (2009). *What are academic disciplines? Some observations on the disciplinary vs. Interdisciplinary debate*. Southampton: ESRC National Centre for Research Methods.

Kumar, R. (2005). Research Methodology: A step-by-step guide to beginners (2nd ed.) SAGE Publications Inc. California.

Kwok, M. (2004). *Disciplinary differences in the development and use of employability skills of recent university graduates.* Paper presented at the 5th Annual Graduate students symposium, University of Manitoba.

Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate peripheral participation*. Cambridge University Press, Cambridge, UK.

Le, K.N. & Tam, W.V. (2008). *On generic skills development: An engineering perspective*. Queensland, Australia.

Le Diest, F. & Winterton, J. (2005). 'What is competence?' *Human Resource Development International,* 8(1), 27-46.

LeGrow, M.R., Sheckley, B.G. & Kehrhalm, M. (2002). Comparison of problem-solving performance between adults receiving credits via assessment of prior learning and adults completing classroom courses. *Journal of continuing Higher Education*, 50 (3), 301-319.

Lester, S. (2007). Professional practice projects: APEL or development? *Journal of Workplace Learning,* 19 (3), 188-202.

Levesque, K. & Lauen, D. (2000). Vocational Education in the United States*:* Toward the year 2000. National Centre for Education Statistics Office of Educational Research and Improvement. Washington DC : US Department of Education

Levin, K.A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry* (2006) 7, 24-25

Lizzio, A. & Wilson, K. (2004). Action learning in higher education: an investigation of its potential to develop professional capability. Studies in Higher Education, 29, 469-488.

Lohman, M.C. (2006). Factors influencing teachers' engagement in informal learning activities. *Journal of workplace learning*, 18, 141-156.

Lordly, D. (2007). Dietetic prior learning assessment: Student and faculty experiences. *Canadian Journal of Deitetic Practice and Research* , 68 (4), 207-12

Lowrie, T. (1999). Policy innovations in the VET sector: The role of instructors in a competency-based environment. Paper presented at the joint AARE/NZARE Conference 'Global issues and effects: The challenge of educational research' Melbourne.

Lowrie, T., Smith, E. & Hill, D. (1999). Competency-based training: A staff development perspective. NCVER, Adelaide, Australia.

Loyens, S. M.M. & Glijbels, D. (2008). Understanding the effects of constructivist learning environments: introducing a multi-directional approach. *Instructional Science*, 36 (56), 351-357

Manpower Services Commission (MSC) (1981). A New Training Initiative agenda for action. Sheffield: MSC.

Mason, G., Williams, G. & Cranmer, S. (2006). *Employability skills Institutes in Higher Education: What effects do they have on Graduate Labour market outcomes*. Institute of Education, University of London, UK.

Matlay, H. (1999). 'Employers 'perceptions and implementation of S/NVQs in Britain: a critical overview', *International Journal of Training and Development,*3(2),32-41.

Matlay, H. & Addis, M. (2002). Competence-based training, vocational qualifications and learning targets: some lessons for the Learning and Skills Council. Education+Training*,* 44 (6), 250–260.

Mayer Committee Report (1992). Key competencies: Report of the committee to advise the Australian Education Council and Ministers of Vocational Education, Employment and Training on employment-related key competencies for post-compulsory education and training, Australian Education Council and Ministers of Vocational Education, Employment and Training, Canberra.

Mayet, A. (2006). Strengthening Education for All of South Africa through RPL. CAEL forum and news. South Africa, *JET Education Services.*

McGrath, S. (2011). Vocational Education and Training for Development: a policy in need of a theory? International Journal of Educational Development, in press.

McGuire, D. & Garavan, N. (2001). Competencies and workplace learning: Some reflections on the rhetoric and the reality. *Journal of Workplace Learning* 13 (4), 144-164

Merriënboer, J. J. G. Klink, M. R. & Hendricks, M. (2002).Competenties: van complicaties tot compromis. Over schuifjes en begrenzers. Den Haag: Onderwijsraad.

Miller, D.C. & Salkind, N.J. (2002). Handbook of Research Design and Social movement. (6th ed.). Sages Publications Inc, UK.

Ministry of Education (MOE) (1993). *The Polytechnic Law 1992, PNDCL 321)*. Accra, Ghana.

Misko, J. (2005). Linking vocational education and training with industry in Australia and China. Adelaide. NCVER,

Misko, J. (2006). Vocational education and training in Australia, the United Kingdom and Germany. Informing policy and practice in the Australian's training system. Australia, NCVER.

Mitchell, J., Clayton, B., Hedberg, J. & Paine N. (2003). Emerging Futures: Innovation in Teaching and Learning in VET. Australian National Training Authority, Melbourne

Mitchell, J., Chappell, C., Bateman, A., & Roy, S. (2006). *Quality is the key: Critical issues in teaching, learning and assessment in vocational education and training.* NCVER, Adelaide.

Mitchell, J., Henry, J. & Young, S. (2006). A new model of work-based learning for the VET sector. Melbourne, ANTA.

MOESS (Ministry of Education, Science and Sports) (2008). Preliminary Education Sector Performance Report (ESPR), Ghana, Accra.

Moore, A, & Rooyen, L.(2002) Recognition of prior learning as an integral component of competence-based assessment in South Africa. *South African Journal of Education*, 22 (4), 293-296.

Moore, T. & Hough, B. (2005). The perils of skills: Academics and employers. *Industry and Higher Education,* 14, 157-164.

Mulcahy, D. & James, P. (2000). Evaluating the contribution of competency-based training: An enterprise perspective. *International Journal of Training and Development,4*(3), 160-175.

Mulder, R.H.& Sloane, P F. E. (2004). *New Approaches to Vocational Education in Europe*: *The construction of complex learning-Teaching arrangements.* Oxford Studies in Comparative Education, Symposium Books,

Mulder, M. (2004). Education, Competence and performance. About learning and development in the Agrifood Business. Wageningen UR. Oratie

Mulder, M., Weigel, T. & Collins, K. (2006). The concept of competency in the development of vocational education and training in selected EU member states. A critical analysis. *Journal of Vocational Education and Training*, 59 (1), 65-85.

Murray, J. (20090. Teacher competencies in the post-method landscape: the limits of competency-based training in TESOL teacher education. 2009 volume 24 No.1

NABPTEX (National Board for Professional and Technician Examinations). (2011). Entry requirements for polytechnics students in Ghana. Accra.

NABPTEX(National Board for Professional and Technician Examinations) (2007). Competency-based assessment for polytechnics in Ghana. Accra.

NCTVET, (2006). *A coordinator's guide to implementing competency-based education in schools*. Jamaica.

NCVER (National Centre for Vocational Education Research) (2003). Fostering generic skills in VET provision and workplaces, Australia. http://www.ncver.edu.au/generic.htm Accessed 21 June 2010.

NCVER (National Centre for Vocational Education Research) (2007). Skills for a nation: A blueprint for improving education and training, 2007-2017.NCVER, Adelaide.

Neilson, J. (2007). The teaching, learning and assessment of generic employability skills. http://www.swslim.org.uk./Documents/GES/ges-guide. Accessed 3 March 2012,

Newman, E. (2011). *Higher Education policies and funding mechanism: towards effective mechanism for financing higher education in Ghana based on international experiences.* Doctoral dissertation. University of Groningen.

Norton, R. E. (1987). Competency-Based Education and Training: A humanistic and Realistic Approach to Technical and Vocational instruction. Paper presented at a the Regional Workshop on Technical / Vocational Teacher Training in Chiba City, Japan, Eric; ED 279910.

NUFFIC (Netherlands Organisation for International Cooperation in Higher Education) NFP-NPT Newsletter, August 2005. The Hague, Netherlands.

Nuffield Review (2008). Apprenticeship 11: A high quality pathway for young people? Nuffield Review of 14-19 Education and Training , England and Wales

Occupational Outlook Handbook, (2011) (ed.) *Fashion Designers.* U.S. Bureau of Labour Statistics. http://dat.bls.gov/cgi-bin/prin.pl/ocos291.htm. Accessed 8 October 2011

OECD (Organisation of Economic Co-operation and Development). (2000). *A new economy? The changing role of innovation and information technology in growth.* OECD, Paris,

OECD (Organisation for Economic Cooperation and Development) (2004). *Innovation in the Knowledge Economy*, Paris: OECD

OECD (Organisation for Economic Co-operation and Development) (2007). Emerging economies, vol. 2007 (14), Education at a Glance 2007: OECD indicators, OECD, Paris.

Ofsted (2011). Common Inspection Framework 2012: Consultation document- proposal for revised inspection arrangements for further education and skill providers from September 2012. Manchester, Ofsted.

Palmer, R. (2009). Skill development, employment and sustained growth in Ghana: Sustainability challenges. *International Journal of Educational Development,* 29 (2009), 133-139.

Peng, W.J., McNess, E., Thomas, S., Wu, X. R. et al (2013). Emerging perceptions of teacher quality and teacher development in China. International Journal of Educational Development, in press

Pennycook, A. (2001). *Critical applied linguistics: A critical introduction*. Mahwah, NJ: Lawrence Erlbaum.

Purcell, J. (2001). National Vocational Qualification and competence-based assessment for Technicians- from sound principles to dogma, London, UK. *Education + Training,* 43 (1), 30-39

Reid, C. & Fitzgerald, P. (2011). Assessment and employability. http://repos.hsap.kcl.ac.uk/content/m10058/1.5/ Accessed January 13, 2012.

Report of the Technical Committee on Polytechnic Education in Ghana, (2001). National Council for Tertiary Education, Accra , Ghana

Reuling, J. (2002). Vocational Training and Lifelong Learning in Australia. Observation and conclusions from a German perspective, Adelaide, NCVER

Robbinson, C. & Misko, J. (2003). *Extending learning opportunities: A study of cooperation between TAFE Institutes and schools and universities in Queensland*, NCVER.

Robinson, L. (2009). A summary of Diffusion of Innovations.

http://creativitecommons.org/licenses/by-nc-nd/2.5/au/deed.en Accessed 31 October 2011.

Robson, C. (2002). *Real world Research: A resource for social scientists and practitioner-researchers.* (2nd ed.). Oxford: Blackwell.

Rogers, E. (1995). *Diffusion of Innovations*. (4th ed.). New York: The Free Press.

Rogers, E.M. (2003). Diffusion of Innovations, (5th ed.). New York: The Free Press.

Sanberg, J. (2000). Understanding human competency at work: An interpretative approach. *Academy of Management Journal,* 43 (1), 9-25

Sanguinetti, J. (20040. *Generic skills for employability: Educational colonisation or educational opportunity.* Melbourne, Australia.

Schofield, K. & McDonald, R. (2004). *Moving on: Report of the high review of training packages*, Australia National Training Authority, Melbourne.

Seezink, A. (2009). Continuing teacher development for competence-based teaching. Unpublished doctoral dissertation. University of Tilburg, The Netherlands.

Seezink, A., & Poell, R.F. (2010). Continuing professional development needs of teachers in schools for competence-based vocational education: A case study from the Netherlands. *Journal of European Industrial Training*, 34 (5), 455-474.

Sekaran, U. & Bougie, R. (2010). Research Methods for Business. A skill Building Approach (5th ed.). John Wiley & Sons, West Sussex: UK.

Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, 27, 4 – 13.

Shalem, Y. & Steinberg, C. (2006). Portfolio-based assessment of prior learning: A cut and mouse chase after invisible criteria. *In Re-theorising the recognition of prior learning* ed. P. Anderson and J. Harris, 97-115, Leicester: NIACE

Silver, H. (1998). *Innovations in Teaching and Learning in Higher Education*: Working Papers, University of Plymouth, Douglas Avenue, Exmouth, Devon, UK.

Smith, E. (1999). Ten years of competency-based training: the experience of accredited training providers in Australia. *International journal of training and Development.* 3, (2), 106-117.

Smith, E. (2010). A review of twenty years of competency-based training in the Australian vocational education and training system. *International journal of training and Development.* 14 (1): 54-64.

Smith, E. & Comyn. P. (2004). The role of employers in the development of employability skills in novice workers. *Research in Post-compulsory Education,* 9 (3), 319-335.

Smith, E., & Keating, J. (1997). *Making sense of the training reform and competency-based training.* Social Press. (ISBN: 1876033193).

Smith, L. (2004). *Valuing RPL*: *Selected case studies of Australian private providers of training*. NCVER, Adelaide.

Smith, L. & Clayton, B. (2009). *Recognising non-formal and informal learning. Insights and perspectives.* NCVER, Adelaide.

Smith, P. & Blake, D. (2005). Facilitating learning through effective teaching. NCVER, Adelaide

Starsz, C. (2011). The purposes and validity of vocational qualifications. SKOPE Research Paper No. 105, November, 2011, RAND Corporation.

Stenlund, T. (2010). Assessment of prior learning in higher education: a review from a validity perspective. *Assessment & Evaluation in Higher Education*, 35 (7), 783-797

Stiwne, E. & Jungert. T. (2010). Engineering students' experiences of transition from study to work. *Journal of Education and Work,* 23 (5), 417- 437.

Sullivan, R. (1995). The Competency-Based Approach to Training. JHPIEGO Strategy.

Sung, J., Raddon, A. & Ashton, D. (2006). Skills Abroad: A comparative Assessment of International Policy Approaches to skills leading to the Development of policy recommendations for the UK. Research report May 16, 2006.

Swailes, S. & Roodhouse, S. (2004). Vocational qualifications and Higher Education: Some policy Issues. *Policy Futures in Education*, 2 (1), 31-52.

Taylor, T. & Clemans, A. (2000). Avoiding the hoops: a study of recognition of prior learning processes in Australia faculties of education. *Asia–Pacific journal of Teacher Education,* 28 (3), 263- 280

Technical Report Series (2001). Report of the Technical Committee on Polytechnic Educaton in Ghana. National Council for Tertiary Education (NCTE), Accra. Ghana.

Thompson, P.(2013). Learner-centred education and cultural translation. International Journal of Educational Development, 33 (2013), 48-58

Thijssen, G. J., Van der Heijden, B. & Rocco, T. (2008). Toward the employability-Link Model: Current employability transition to future employment perspectives. *Human Resource Development Review* 2008 7: 165.

Tigelaar, D.E. H., Dolmas, D.H.J.M., Wolfhagen, I.H.A.P. & Van der Vleuten, C.P.M. (2004). The development and validation of a framework for teaching competencies in higher education. *Higher Education*, 48, 253-268.

Tikly, L. & Barrett, A.M. (2011).Social justice, capabilities and the quality of education in low income countries. International Journal of Educational Development 31(2011) 3-14.

Tolley, H., Greenbatch, D., Bolton, J. & Warmington, P. (2003). Improving occupational learning: The validity and transferability of NVQ's in the workplace. CDELL, Nottingham

Trigwell, K. (2002). Approaches to teaching design subjects: a quantitative analysis. *Art, Design and Communication in Higher Education* 1, 69 – 80.

UNESCO. (2010). World conference on higher education 2009: Final report, Paris, UNESCO Headquarters: 5 to 8 July, 2009. http://unesdoc.Unesco.org/images/0018/001892/189242e.pdf

Van den Berg, M. N. & Hofman. W.H.A. (2005). Student success in university education: A multi-measurement study of the impact of student and faculty factors on study progress. *Higher Education,* 50, 413-446.

Van der Heijden, B.I.J.M. (2005). *No one has ever promised you a rose in garden. On shared responsibility enhances strategies throughout careers.* Inaugural address delivered at the Open University of the Netherlands, Heerlen/Assen: Van Gorcum.

Van Eijl, P.J. (1986). Modular programming of curricula. *Higher Education,* 15: 449-57.

Velde, C. (1999). An alternative conception of competence: implications for vocational education. Journal of Vocational Education and Training, 51(3), 437-447.

Vermetten, Y.J., Vermunt, J.D., & Lodewijks, H. G. (2002). Powerful learning environments? How university students differ in their responses to instructional measures. *Learning and Instruction*, 12, 263-284

Virtanen, P. Nevgi. A. (2010). Disciplinary and gender differences among higher education students in self-regulated learning strategies. *Educational Psychology,* 30(3), 323-347

Waterhouse, P. & C. Virgona. (2004). *Two-dimensional work: Workplace literacy in the aged care and call centre industries*. NCVER, Adelaide.

Weigel, T., Mulder, M. & Collins. K. (2007). The concept of competence in the development of vocational education and training in selected EU member states. *Journal of Vocational Education and Training,* 59 (1), 53-66.

Wesselink, R. (2010). Comprehensive competence-based vocational education: The development and use of a curriculum analysis and improvement model. Wageningen University, The Netherlands.

Wesselink, R. & Wals, E. J. (2011). Developing competence profiles for educators in environmental education in the Netherlands. *Environmental Education Research,* 17 (1), 69-90.

Wesselink, R., M. A. Dekker-Greon, J.A. Biemans, & M. Mulder. (2010). Using an instrument to analyse competence-based study programmes: experiences of teachers in Dutch vocational education and training. *Journal of Curriculum Studies,* 42(6), 813-829

West, J. (2004). *Dreams and Nightmares*. The NVQ experience.Working paper No.45 Centrre for Labour Market Studies (Liecester: CLMS)

Westra, W. (2001). Competences in education: a confusion of tongues. *Journal of Curriculum Studies*, 33 (1), 75-88

Wheelahan, L. & Moodie, G. (2011). *Rethinking skills in vocational education and training: From competencies to capabilities*, Melbourne.

Wheelahan, L., Dennis, N. & Firth, J. (2002). *Recognition of Prior learning. Policy and practice in Australia.*

Whittaker, S., Whittaker, R. and Cleary, P. (2006). 'Understanding the transformative dimensions of RPL' in Re-theorising the recognition of prior learning, eds. Per Anderson and Judy Harris, *National Institute of Adult Continuing Education, Leicester,* pp, 301-19.

Whittingham, K. Ferrier, F. & Trood, C. (2003). Going boldly into the future: A VET journey into the national innovation system, NCVER, Adelaide.

Williams, A. (1999). *Creativity, Invention and Innovation.* Allen & Unwin, Sydney.

Williams, M., Bateman, A. (2003). Graded assessment in vocational education and training. NCVER, Australia.

Winterton, J., Delamare Le-Deist, F. & Stringfellow, E. (2005). *Topology of knowledge , skills and competences: clarification of the concept and prototype.* (Thessaloniki, Cedefop)

World Bank, (2008a). Ghana job creation and skill development Draft Report, January 29. volume 1: Main Document, Report No. 40328-GH,World Bank, Washington.

World Bank. (2008b). Linking Education Policy to Labour Market Outcomes, The World Bank, Washington DC

World Bank. (2009). Accelerating Catch-up: Tertiary Education for Growth in Sub-Saharan Africa.

World Development Report, (2007). *Development and the Next Generation,* Washington, DC. http://www.ameprc.mq.edu.au/docs/prospect_journal/. Accessed 21 October 2011.

Yorke, M. (2007). *Employability in higher education: What it is and what it is not*. Higher Education Academy, ESECT Series 1.

Zaharim, A., Y. Yusoff, M. Omar, A. Mohamed, & N. Muhamad. (2009). Engineering employability skills by required employers in Asia. *Proceedings of the 6th WSEAS International Conference on Engineering Education*, Asia.

Appendix

Questionnaire for students in CBT programmes

SECTION A

Background information

INSTRUCTIONS: **For each item, please tick (✓) the box(es) corresponding to your choice(s) or provide the appropriate response(s) in writing.**

1. Name of Polytechnic.……

2. Gender: Female [ ] Male [ ]

3. What school did you attend before gaining admission into this polytechnic? (Please tick only one)
   - [ ] Senior Secondary school
   - [ ] Secondary technical school
   - [ ] Vocational training
   - [ ] Technical institute
   - [ ] Teacher Training college

   Other, (Please specify) ……

4. What is your programme of study?.....

5. Which year did you start your study programme?
   - [ ] 2004
   - [ ] 2005
   - [ ] 2006
   - [ ] 2007
   - [ ] 2008
   - [ ] 2009

SECTION B

Teaching and Learning Modules

	How do you rate your agreement with the organisation of modules in CBT lessons				
	Item	Strongly agree	Agree	Disagree	Strongly disagree
6.	A module is a unit of study that consists of knowledge, skill and work-related activity.	□	□	□	□
7.	All the courses of study are organized in modules.	□	□	□	□
8.	Selection of learning modules are done by both lecturers and students.	□	□	□	□
9.	Students progress from one learning module to another after mastering a specific skill.	□	□	□	□
10.	Assessment of a module usually takes place in the workshop or created environment similar to the workplace.	□	□	□	□
11.	Assessment of a module involves both written and practical examinations.	□	□	□	□

12. Do you receive credit or exemption from your prior skills or knowledge in your training courses?

[ ] Yes

[ ] No

13. If your answer in Q12 is **Yes,** how is your prior skills/ knowledge assessed for credit or exemption in the training?
    [ ] through questions and answers
    [ ] project work presentation
    [ ] solve a problem in a given context
    [ ] through certificates and portfolios
    Other, (Please specify) ……

14. What is the primary focus of assessment in your course of study?
    [ ] what the student knows and can reproduce
    [ ] what the student can actually perform in a given context
    [ ] what the student can understand and explain
    [ ] what the student can remember and give a report on.

15. In what ways are the specialists from the industries involved in your course of study?
    [ ] as lecturers
    [ ] project assessors
    [ ] monitors
    [ ] development of competency standards
    [ ] supervising attachment programmes
    Other, (Please specify) ……

16. Which people are involved in assessing your performance in your course of study?
    [ ] Course lecturers only
    [ ] specialists from the industry
    [ ] Both course lecturers and specialists from industry
    Other, (Please specify) ……

17. Is the assessment criteria made available to students in advance?
    [ ] Yes
    [ ] No

18. Is your performance at the end of every unit of study or module graded as **Competent (Pass)** or **Not yet competent (Fail**)?
    [ ] Yes
    [ ] No

SECTION C

Performance grading

	If your answer to Q18 is **Yes,** how do you rate your agreement on this grading system?				
	Item	Strongly agree	Agree	Disagree	Strongly disagree
19.	It shows level of competence at the end of a module	□	□	□	□
20.	It provides class distinction between high achievers and low achievers	□	□	□	□
21.	It is accepted by higher institutions and employers	□	□	□	□
22.	It provides details about the strengths and weaknesses of the learner.	□	□	□	□

23. How does learning take place in the classroom?
    [ ] students learn at their own pace with minimal assistance from teachers
    [ ] instructors deliver the lessons and provide assignments
    [ ] take down lecture notes from instructors
    Other, (Please specify) ……
24. Does this form of learning in Q23 help you to make progress in your studies?
    [ ] Yes
    [ ] No
25. If your answer to Q23 is **No,** what are some of the difficulties you face in your studies?
    (Please tick as many as apply)
    [ ] difficult to understand the topics treated
    [ ] assistance from lecturers is not enough
    [ ] inadequate training materials
    [ ] insufficient time to study
    [ ] no feedback is provided
    [ ] workload is too much
    Other, (Please specify) ……
26. What do you suggest to be put in place to improve the quality of teaching and learning in the classroom?
    [ ] need more assistance from lecturers
    [ ] provision of adequate equipment and learning materials
    [ ] re-training of lecturers to handle the courses effectively
    [ ] combine theory with more practical activities
    Other, (Please specify) ……

SECTION D

Internship programme

27. How many times have you undertaken industrial attachment in your study programme?
    [ ] none
    [ ] one
    [ ] two
    [ ] three
28. When did you do your last attachment?
    [ ] 1st half of 2007
    [ ] 2nd half of 2007
    [ ] 1st half of 2008
    [ ] 2nd half of 2008
    [ ] 1st half of 2009
    [ ] 2nd half of 2009
    Other, (Please specify) ……
    Please, provide the place of attachment…….
29. How did you get your place of industrial attachment?
    [ ] through my own effort
    [ ] through the polytechnic administration
    Other, (Please specify) ……
30. How relevant was your place of attachment to your course of study?
    [ ] Very relevant
    [ ] Relevant
    [ ] Not very relevant
    [ ] Not relevant at all
31. Did you receive assessment at the place of attachment?
    [ ] Yes
    [ ] No
32. If Yes, in Q 31, how did the school receive the results of your performance from the attachment?
    [ ] l submitted my own report to the school.
    [ ] A confidential report was sent to the school
    [ ] l did not receive any report
    Other, (Please specify) ……
33. How do you assess your own performance at the place of attachment?
    [ ] Very satisfactory
    [ ] Satisfactory
    [ ] Dissatisfied
    [ ] Very dissatisfied
34. What kind of challenges did you face in your attachment programme?
    [ ] No guidance and support from the polytechnic management
    [ ] Problem of looking for a place of attachment
    [ ] Problem of getting well-equipped personnel to supervise my work
    [ ] study programme is not related to conditions at the workplace
    Other, (Please specify) ……

SECTION E

Acquisition of skills and attributes

	Give your opinion on the effectiveness of your training in developing the following skills and attributes.				
	Item	Very effective	Effective	Not effective	Not at all
35.	Ability to apply skills and knowledge in your field of study	□	□	□	□
36.	Ability to use basic computer skills	□	□	□	□
37.	Ability to analyze information	□	□	□	□
38.	Ability to apply creative problem-solving strategies	□	□	□	□
39.	Ability to plan and organize tasks	□	□	□	□
40.	Ability to negotiate and make decisions	□	□	□	□
41.	Ability to work in teams	□	□	□	□
42.	Ability to transfer skills and knowledge in a new situation	□	□	□	□
43.	Opportunities for getting a job relevant to the field of study	□	□	□	□

SECTION F

Overall assessment of the study programme

	Considering your study programme, how do you rate your agreement on each of the following in the training process?				
	Item	Fully agree	Agree	Disagree	Fully disagree
44.	The level of the modules is suitable to achieve the required competencies	□	□	□	□
45.	The modules have been organized from simple to complex.	□	□	□	□
46.	Modules are spread in a range of courses throughout the study programme.	□	□	□	□
47.	The overall quality of the programme or curriculum is good	□	□	□	□
48.	The quality of teachers is good	□	□	□	□
49.	Teachers have enough ICT skills	□	□	□	□
50.	Teachers clearly have the skills in lessons delivery	□	□	□	□
51.	Teachers have high level of motivation.	□	□	□	□
52	Study counselling is adequate	□	□	□	□
53	Training involves relevant practical activities	□	□	□	□
54	Training involves the knowledge and values that underlie performance	□	□	□	□
55	Training involves learning to work independently	□	□	□	□
56	Assessment is based on demonstration of skills	□	□	□	□

57	Feedback from assessment (exams or other performances /product) is adequate	□	□	□	□
58	Feedback from study progress is adequate	□	□	□	□
59	Information about labour market possibilities (jobs) is adequate	□	□	□	□
60	The study programme meets my expectation	□	□	□	□
61	The study programme is too difficult.	□	□	□	□

62. How has the introduction of CBT affected teaching and learning process in your department for the past two years? *(Please tick as many as apply)*

[ ] Content of the modules or units is more related to the workplace standards
[ ] Assessment involves a lot of practical activities
[ ] Learning is centred on students' own activities.
[ ] No difference in teaching and learning process between CBT and traditional programme
[ ] CBT lessons are more confusing to both teachers and learners than traditional programmes
Other, (Please specify) ……

63. How would you rate your overall satisfaction with your study programme up till now?

[ ] Very satisfied
[ ] Satisfied
[ ] Dissatisfied
[ ] Very dissatisfied

Summary

The pressure for change in teaching and learning in the vocational and educational training (VET) systems is becoming increasingly crucial due to reasons such as global economics, industry restructuring and policy initiatives from governments. In this regard, the development and application of skill standards derived from the curricula of competency-based training (CBT) is one major teaching and learning approach that is believed to have a strong potential to increase skill levels, reduce unemployment rate, increase productivity and to achieve international competitiveness (Smith & Blake, 2005).
To this end, the curricula of five study programmes run by polytechnics in Ghana have been redesigned as competency based; they are being run on a pilot basis but could be replicated in other study programmes. For this reason, this dissertation focuses on the effect of CBT implementation on teaching and learning processes in Ghanaian polytechnics.

In chapter 1, we explain theoretical concepts related to educational innovation, philosophies and international experiences in the implementation of CBT in VET systems. As CBT emphasises on mastery of a job-specific skills, it is not adequate in the context of rapid pace of technological change and high labour mobility. Individuals require the capacity to be flexible, take initiative and exhibit adaptability to different settings by means of employability skills (Neilson 2007). Accordingly, this thesis sought to provide answers to the following research questions:

1. What lessons can be drawn from international CBT experiences to support implementation processes in Ghana?
2. To what extent do the linkages between industry and polytechnics, modular structure, assessment practices and performance grading indicate the effectiveness of CBT implementation?
3. To what extent do different CBT features, such as modular structure, involvement of industry and assessment practices, influence the acquisition of professional skills?
4. How do students' background characteristics, study programmes and industry training influence their acquisition of employability skills in CBT implementation?

A conceptual model of CBT implementation in Ghanaian polytechnics was developed (see Figure 1.2) to explain the interrelationship among the variables in the study. The policy context refers to the government's education policy, funding arrangements, accreditation and quality assurance procedures. Industry participation in CBT relates to the development of competency standards, internship programmes and quality assurance.
Teaching and learning modules refer to breaking down the curricula of study programmes into independent units to ensure students' mastery of each task before progression to a more advanced level. The modules factor includes quality of teaching and learning, recognition of prior learning (RPL), nature of feedback, assessment and grading. Effective collaboration with industry and the quality of instruction in the teaching and learning modules should have direct effects on the achievement of competence. We also expect students' background characteristics to exert direct effects on competence and anticipate an

interaction effect with industry and teaching and learning modules. The dependent variable, achievement of competence, is indicated by the use of CBT features in the acquisition of skills and attributes required to perform professional tasks.

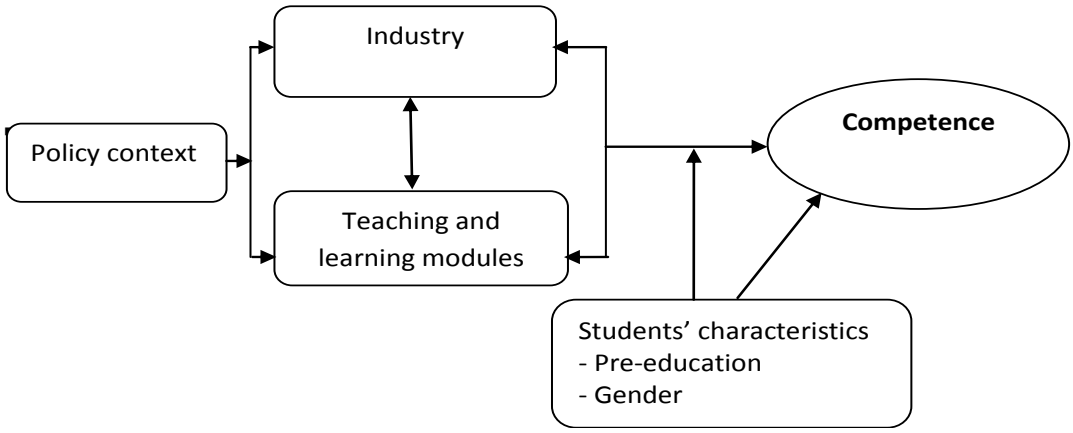


Figure 1.2. Conceptual model for CBT implementation in Ghanaian polytechnics

Design

The design of the study is described in chapter 2. Two student surveys (baseline and follow-up) were conducted to assess the effect of CBT implementation on the teaching and learning processes in Ghanaian polytechnics in a repeated cross-sectional design. The first study involved first- and second-year CBT students and non-CBT students in their third and final years in each study programme. Participants in the second study consisted of first-, second-, and third-year CBT students only, because the non-CBT system in all the study programmes under review had been phased out, which made it impossible to conduct a longitudinal study with all participants because the non-CBT students simply were not available for participation.

In the first or baseline study, (251) 93% of CBT students and (208) 77% of non-CBT students participated. Thus, the first survey focused on students pursuing CBT piloted programmes and those pursuing the same study programmes but through a traditional training system. It also included CBT teachers, heads of department and deans of faculty. The questionnaires were designed for teachers and students while interviews served to gather the insights from heads of departments or deans.

The second or follow-up survey focused on CBT students, with the purpose of evaluating the perceived effects of CBT on the acquisition of skills and attributes to perform professional tasks. A total of (316) 63.2% student participated in the study, including those studying agricultural engineering (124), automobile engineering (34), building technology (61), civil engineering (68) and fashion design (29). Both studies involved all ten polytechnics in Ghana. Questionnaires for both studies were divided into six sections, with each section addressing one of the main variables: teaching and learning modules, linkage between industry and training institutions, assessment and performance grading, acquisition of employability skills and students' own assessments of their study programmes.

Summary of results

International perspectives on the implementation of CBT

Chapter 3 explored CBT implementation in countries with several years of experience, such as the United Kingdom and Australia, to provide a broader overview of the directions, issues, and innovative structures in play and draw lessons for Ghana and other countries in the process of CBT implementation. The study focused on two CBT characteristics, closely linked to the achievement of employability: recognition of prior learning (RPL) and industry-institution links. The study addressed two research questions: To what extent do RPL and industry and institution linkages in CBT implementation help achieve employability? And what lessons can be drawn from international experiences to support CBT implementation in Ghana and other emerging VET institutions? The study revealed an apparent difficulty among candidates to identify and articulate their own prior learning in writing and provide corresponding evidence. Innovative techniques, such as e-portfolio and on-line facility could provide greater awareness and quality information to assist learners to produce work-related evidence. Performance criteria in RPL assessment must cover situational contexts and contingency management skills to enhance flexibility and adaptable labour force. For Ghana to achieve the benefits of industry and VET collaboration requires formation of industry-led agencies, innovative partnerships and development of the workplace as a learning arena. The mutual benefits in this collaboration include adequate equipment and training facilities, specialised expertise, workplace training, the smooth transition of students from school to work and increased production.

Implementation of CBT in Ghanaian polytechnics

Chapter 4 aimed to examine the extent to which the polytechnics adapted their educational practices in the context of CBT. It specifically focused on variables such as industry and institution linkage, the use of modular structures, assessment practices, lesson delivery and performance grading as implemented in CBT. The central question was, 'To what extent are linkages between industry and polytechnics, modular structure, assessment practices and performance grading indicators of the effectiveness of CBT implementation'? The results showed that the level of understanding of CBT was consistent across management, staff and CBT students in the polytechnics. The role of industry was prominent during the internship programme through mentoring and placements of students. Furthermore, only six of the twelve features of CBT considered in this study formed part of the implementation processes. Learners' prior knowledge and skills were not assessed for credit transfer or exemption from courses in training.

Similarly, students' inputs are not considered in the selection of teaching and learning modules and progression through modules is determined without the basis of mastery of a specific skill. Assessment was generally theoretical involving both norm and criterion-referencing form of grading.

Acquisition of professional skills in the context of CBT

Chapter 5 examined the perceived effects of CBT on the acquisition of professional skills. The main study variables were the modular structure, industry involvement and assessment practices, with quality of teachers and feedback from assessment as intermediary variables. The central research question was, 'To what extent do features such as modular structures, involvement of industry and assessment practices, together with quality of teachers and feedback influence the acquisition of competencies required to perform professional tasks? The results showed a strong, significant effect of the use of modular structures on the quality of teachers as well as a strong effect on feedback.

Appropriate teaching and learning modules thus promote the quality of teaching and assist teachers in providing effective feedback on students' learning. The results also show a moderate, direct effect of teacher quality on professional skills. We observed an indirect effect of teacher quality on professional skills through feedback. Contrary to our expectations based on other studies (Waterhouse and Virgona, 2004), we found no direct or indirect effect of industry participation on the acquisition of professional skills. No relationship emerged between assessment practices and the acquisition of professional skills either.

Disciplinary perspectives of CBT and employability skills

Chapter 6 explored the implementation of five main CBT study programmes in the polytechnics and their influence on the achievement of employability skills. The central research question was: To what extents do study programme and students' background characteristics influence the achievement of employability skills in the implementation of CBT in Ghanaian polytechnics? The results showed that study programmes involving student-centred learning have significant effects on the acquisition of employability skills. Furthermore, we found a strong, statistically significant effect of industry training on the acquisition of employability skills, consistent with previous studies (Crebert et al., 2004). In contrast with our expectation based on previous findings (Van den Berg and Hofman, 2005), we found no statistically significant effect of gender on the acquisition of employability skills. However, pre-education had significant effects on employability skills even though no such evidence appeared in different study programmes. As we posited, students in vocational and technical institutes acquired higher levels of employability skills.

In chapter 7 we discuss in broader perspective the main outcomes of the study in relation to teaching and learning modules, assessment and task-oriented feedback, industry participation in CBT, acquisition of employability skills and their implications for educational practice and further research.

Samenvatting

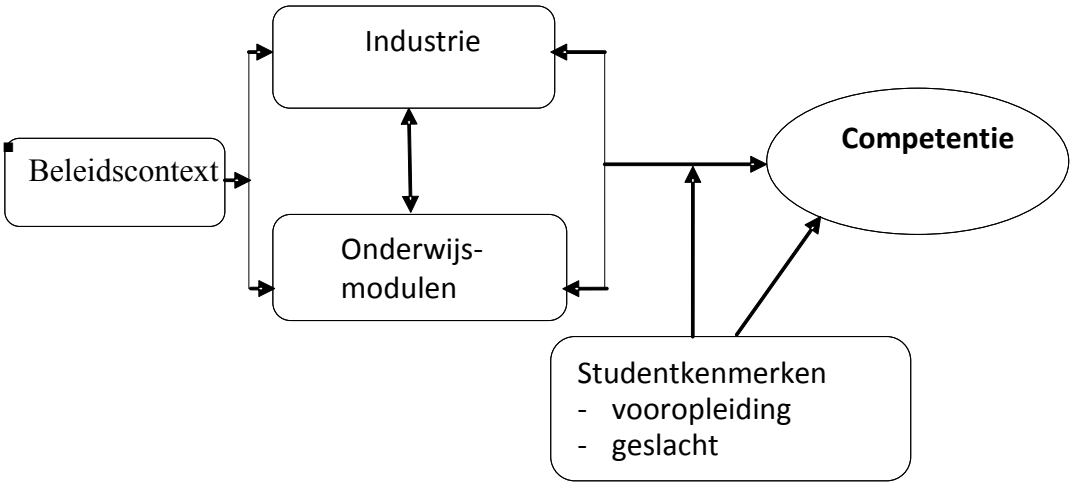
Ontwikkelingen zoals de globalisering van de economie, de herstructurering van industrieën en nieuwe beleidsinitiatieven van regeringen hebben de druk op het hoger beroepsonderwijs opgevoerd om veranderingen door te voeren in de onderwijs- en leermethodes. De formulering en toepassing van vaardigheidsstandaarden, gedefinieerd vanuit curricula die zijn gebaseerd op het zogenaamde 'competency-based-training-principe' (CBT), zijn maatregelen die een grote rol kunnen gaan spelen in het verhogen van het niveau van vaardigheden, het terugbrengen van de werkloosheid, het intensiveren van de productiviteit en het realiseren van internationale competitiviteit (Smith & Blake, 2005). Zo zijn de curricula van vijf onderwijsprogramma's in polytechnische scholen in Ghana aangepast, gebaseerd op competentiegericht onderwijs. Dit zijn pilots, maar zij kunnen zeker richtinggevend zijn voor de herziening van andere curricula. Deze dissertatie richt zich op het effect van de invoering van het CBT-principe op de onderwijs- en leerprocessen in polytechnische scholen in Ghana.

Hoofdstuk 1 behandelt enkele theoretische concepten gerelateerd aan onderwijsinnovatie, de onderliggende filosofie en de internationale ervaringen met de invoering van CBT in het hoger beroepsonderwijs. De nadruk die CBT legt op de beheersing van vooral specifieke beroepsvaardigheden is minder passend in een context die zich kenmerkt door een snelle opeenvolging van technologische veranderingen en een hoge arbeidsmobiliteit. Mensen op de arbeidsmarkt moeten juist flexibel zijn en in staat om zelf initiatieven te nemen en zich met behulp van hun vaardigheden aan te passen aan verschillende werksituaties (Neilson, 2007). Deze dissertatie heeft daarom getracht antwoorden te vinden op de volgende onderzoeksvragen:

1. Welke lessen kunnen er worden getrokken uit de internationale ervaringen met CBT om de invoering van deze methode in Ghana te ondersteunen?
2. In welke mate tonen de relatie tussen de industrie en het polytechnische onderwijs, de modulaire structuur, de wijze van toetsing en de prestatiebeoordeling, de effectiviteit aan van de invoering van CBT?
3. In welke mate beïnvloeden de verschillende kenmerken van CBT, zoals de modulaire structuur, de betrokkenheid van de industrie en de wijze van beoordeling, het verwerven van beroepsgerelateerde vaardigheden door studenten?
4. Hoe beïnvloeden zaken zoals de achtergrond van de student, onderwijsprogramma's en stagetrainingen het verwerven van beroepsgerelateerde vaardigheden door studenten?

Om de onderlinge relaties te verklaren tussen de variabelen in de studie is een conceptueel model ontwikkeld van de introductie van CBT in het Ghanese polytechnische onderwijs. Hierin verwijst de beleidscontext naar het onderwijsbeleid van de overheid, de financiering, de accreditatieprocedures en de standaarden voor de waarborging van de onderwijskwaliteit. Participatie van de industrie in CBT houdt de ontwikkeling in van vaardigheidsstandaarden, stageprogramma's en kwaliteitsbewaking. Onder onderwijs- en

leermodules wordt verstaan het opsplitsen van de onderwijsprogramma's in onafhankelijke eenheden waarbij het principe wordt gehanteerd dat voordat studenten overgaan tot een hogere module, de taken die deel uitmaken van eerdere modules geheel moeten worden beheerst. De factor 'modulen' omvat de kwaliteit van het onderwijs en leren, het RPL-concept (recognition of prior learning: erkenning van kennis opgedaan in de praktijk buiten een leerinstituut), en zaken zoals feedback, de beoordelingsmethode en het geven van cijfers. Wij verwachtten dat een effectieve samenwerking met de industrie en adequate instructie in de onderwijs- en leermodules directe effecten zouden hebben op het succesvol leren verwerven van competenties. Tevens verwachtten wij een directe invloed van de achtergrondkenmerken van studenten op hun competenties, alsmede een interactie-effect tussen de industrie en de onderwijs- en leermodules. De afhankelijke variabele in deze studie, het verwerven van een competentie, betreft het gebruik van CBT-componenten in het verwerven van vaardigheden en elementen die vereist zijn voor het uitvoeren van operationele taken.



Figuur 1.2. Conceptueel model van de CBT-implementatie in het Ghanese polytechnische onderwijs

Onderzoekontwerp

In hoofdstuk 2 staat het ontwerp van de studie beschreven. Om het effect te bepalen van de CBT-implementatie op de onderwijs- en leerprocessen in de Ghanese polytechnische scholen werden twee onderzoeken (basis en vervolg) uitgevoerd. Deze onderzoeken waren cross-sectioneel. Het eerste onderzoek betrof eerste- en tweedejaars CBT-studenten en non-CBT-studenten in hun derde en laatste jaar uit alle studieprogramma's. De deelnemers aan het tweede onderzoek bestonden alleen uit eerste-, tweede- en derdejaars CBT-studenten, aangezien de onderwijsprogramma's in deze periode geen elementen meer bevatten, die gebaseerd waren op niet-competentiegericht onderwijs. Doordat er in deze tweede periode geen niet-CBT-studenten waren, was het dus niet mogelijk om een longitudinaal onderzoek uit voeren met alle deelnemers aan de studie.

Het eerste/basisonderzoek bestond uit 93% (251) CBT-studenten en 77% (208) non-CBT-studenten. Dit onderzoek betrof zowel studenten die aan de CBT-pilotprogramma's meededen als degenen die dezelfde onderwijsprogramma's volgden op basis van het traditionele onderwijssysteem. Ook CBT-docenten, afdelingshoofden en decanen participeerden in het onderzoek. Om de docenten en studenten te ondervragen werden er enquêtes ontworpen, en door middel van interviews werden de ervaringen van de afdelingshoofden en decanen in kaart gebracht.

Het tweede/vervolgonderzoek richtte zich op de CBT-studenten met als doel het evalueren van de effecten van CBT op het verwerven van vaardigheden voor het uitvoeren van taken in het arbeidsproces, zoals ervaren door de deelnemers aan de studie. In totaal participeerde 63,2% (312) van de studenten in de studie, verspreid over de vakgebieden landbouwtechniek (124), automobieltechniek (34), bouwkunde (61), civiele bouwkunde (68) en modeontwerp (29). Alle tien polytechnische instellingen deden mee aan beide studies. De vragenlijsten die werden gebruikt waren opgesplitst in zes onderdelen die ieder betrekking hadden op een van de volgende variabelen: onderwijs- en leermodules, de relatie tussen industrie en leerinstellingen, prestatiebeoordeling en becijfering, het verwerven van beroepsvaardigheden, en de beoordeling van de studenten zelf over hun onderwijsprogramma's.

Samenvatting van de resultaten

Internationale gezichtspunten op de invoering van CBT

Hoofdstuk 3 beschrijft de invoering van CBT in landen die al enkele jaren ervaring hebben met deze methode, zoals Groot Brittannië en Australië. Hiermee wordt in bredere zin een overzicht gegeven van zaken die spelen bij CBT, zoals de richting van de doelstellingen en de innovatieve aspecten, en informatie waaruit lessen kunnen worden getrokken bij de implementatie van CBT in Ghana en in andere landen. De studie richtte zich met name op twee CBT-kenmerken die beide een nauwe relatie hebben met het verwerven van een algehele inzetbaarheid op de arbeidsmarkt: RPL (recognition of prior learning) en de relatie tussen de industrie en leerinstellingen. Twee onderzoekvragen stonden in dit verband centraal: 'In welke mate stimuleren RPL en de relatie tussen de industrie en leerinstellingen de inzetbaarheid in het arbeidsproces?' en: 'Welke lessen kunnen worden getrokken uit de internationale ervaringen met CBT die kunnen worden gebruikt bij de invoering van deze methode in Ghana en in andere landen die gaan werken op basis van VET?'

Het onderzoek heeft aangetoond dat het identificeren en schriftelijk weergeven van eerder opgedane kennis, alsmede het tonen van bewijs hiervan, door kandidaten als moeilijk werd ervaren. Innovatieve technieken, zoals e-portfolio's en andere online-faciliteiten zouden kunnen bijdragen aan meer bewustwording op dit gebied, en mensen kunnen helpen bij het verstrekken van beter inhoudelijk bewijs van hun werkgerelateerde kennis. Om een arbeidsbevolking op te leiden die meer flexibel is en die zich beter kan aanpassen aan verschillende werkomstandigheden dienen de prestatiecriteria in RPL-evaluaties dan ook

betrekking te hebben op zowel de situationele context als op vaardigheden op het gebied van contingentiemanagement. Voorts, om te kunnen profiteren van de voordelen van een samenwerkingsverband tussen de industrie en VET-opleidingen, zal men in Ghana moeten overgaan tot het introduceren van leerinstellingen die zijn opgezet vanuit deze industrie. Verder is er een innovatieve samenwerking vereist tussen onderwijs en praktijk waarbij werkplekken worden omgezet in leeromgevingen. De voordelen van deze samenwerking zullen onder anderen bestaan uit de realisatie van goede voorzieningen en onderwijsfaciliteiten, gespecialiseerde kennis, leren op de werkvloer, een soepele overgang van studenten naar de werkpraktijk en een verhoging van de productie.

Invoering van CBT in het Ghanese polytechnische onderwijs

Hoofdstuk 4 onderzoekt de mate waarin de polytechnische scholen in Ghana hun praktische onderwijsmethoden hebben aangepast in het kader van CBT. Aandachtspunten in de context van CBT zijn hierbij variabelen zoals de relatie tussen de industrie en leerinstellingen, het gebruik van een modulaire structuur, de beoordelingsmethode, het lesgeven en de becijfering. De kernvraag is: 'In welke mate zijn de relatie tussen de industrie en het polytechnische onderwijs, de modulaire structuur, de beoordelingsmethode en de becijfering indicatoren van de effectiviteit van de invoering van CBT?'. De resultaten lieten zien dat het begripsniveau met betrekking tot CBT consistent was onder zowel het management, de onderwijsstaf, als de polytechnische studenten. Verder vervulde de industrie in termen van begeleiding en de plaatsing van studenten een prominente rol tijdens de stageprogramma's. Slechts zes van de twaalf kenmerken van CBT zoals besproken in deze studie maakten echter deel uit van het implementatieproces. Zo werd er geen aandacht geschonken aan eerder opgedane kennis en vaardigheden voor doeleinden zoals het toekennen van punten of de vrijstelling van vakken. Voorts werd bij de keuze van de onderwijs- en leermodulen informatie van studenten niet in ogenschouw genomen. Tevens werd niet het principe toegepast dat pas kan worden doorgegaan met een volgende module als de specifieke vaardigheid behandeld in de vorige module geheel wordt beheerst. Tenslotte betrof de component 'beoordeling' in het algemeen alleen de theorie, waarbij de becijfering was gebaseerd op bepaalde normen en criteria.

Het verwerven van arbeidsgerelateerde vaardigheden in de context van CBT

Hoofdstuk 5 onderzoekt de waargenomen effecten van CBT op de verwerving van arbeids-gerelateerde vaardigheden. De belangrijkste variabelen in de studie waren de modulaire structuur, bemoeienis van de industrie, en de beoordelingscomponent, met als intermediaire variabelen kwaliteit van de leerkrachten en feedback vanuit de beoordeling. De centrale onderzoeksvraag was: 'In welke mate beïnvloeden kenmerken zoals de modulaire structuur, betrokkenheid vanuit de industrie en beoordelingsactiviteiten, tezamen met de kwaliteit van de leerkrachten plus feedback, de verwerving van vaardigheden benodigd voor het uitvoeren van operationele taken?' De resultaten lieten zien dat het gebruik van de modulaire structuur een sterk significant effect had op de kwaliteit van de leerkrachten en de feedback. Passende onderwijs- en leermodules verhogen dus de kwaliteit van het

onderwijs en ondersteunen de leerkrachten in het geven van effectieve feedback op de leerprestaties van de studenten. Ook lieten de resultaten een matig direct effect zien van de kwaliteit van de leerkracht op de verwerving van beroepsgerelateerde vaardigheden. Voorts stelden wij een indirect effect vast van de kwaliteit van de leerkracht op de beroeps-gerelateerde vaardigheden door middel van feedback. In tegenstelling tot onze aannames, gebaseerd op andere studies (Waterhouse en Virgona, 2004), toonde ons onderzoek niet aan dat betrokkenheid vanuit de industrie een indirect effect had op de verwerving van beroeps-gerelateerde vaardigheden. Ook was er geen relatie tussen het verwerven van beroeps-gerelateerde vaardigheden en de gebruikte beoordelingsmethode.

Gezichtspunten op CBT vanuit meerdere disciplines en arbeidsgerelateerde vaardigheden
Hoofdstuk 6 behandelt de invoering van CBT in vijf onderwijsprogramma's in het polytechnische onderwijs in Ghana en de invloed van deze methode op de verwerving van beroepsgerelateerde vaardigheden. De centrale onderzoeksvraag was: 'In welke mate beïnvloeden onderwijsprogramma's op basis van CBT en de achtergrond van studenten de verwerving van beroepsgerelateerde vaardigheden door deze studenten in het Ghanese polytechnische onderwijs?'. De resultaten toonden aan dat onderwijsprogramma's waarin een studentgerichte leermethode werd gehanteerd een significant effect hadden op de verwerving van beroepsgerelateerde vaardigheden. Voorts troffen wij ook een sterke en statistisch significante relatie aan tussen de verwerving van beroepsgerelateerde vaardigheden en betrokkenheid vanuit de industrie, wat overeenkomt met de resultaten van eerdere studies (Crebert et al., 2004). In tegenstelling tot onze verwachting, gebaseerd op eerder onderzoek (Van den Berg en Hofman, 2005), konden wij niet aantonen dat geslacht een statistisch significant effect had op verwerving van beroepsgerelateerde vaardigheden. Vooropleiding had echter wel een significant effect op de verwerving van beroepsgerelateerde vaardigheden, hoewel hier geen bewijs voor werd geleverd vanuit de verschillende onderwijsprogramma's. Voorts waren de vaardigheden verworven door studenten die onderwijs volgden in instellingen voor beroeps- en technisch onderwijs van een hoger niveau, zoals overeenkwam met onze stelling betreffende dit punt.

In hoofdstuk 7 worden vanuit een breder perspectief de belangrijkste resultaten van deze studie besproken in relatie tot de aspecten onderwijs- en leermodules, de beoordelingsmethode en taakgerelateerde feedback, deelname van de industrie aan CBT en de verwerving van beroepsgerelateerde vaardigheden. Tenslotte gaat dit hoofdstuk in op de implicaties van deze studie voor de onderwijspraktijk en voor het vervolgonderzoek in dit onderzoeksgebied.

RESEARCH PUBLICATIONS

Boahin, P. & Hofman, W.H.A.(2012). Implementation of innovations in higher education: the case of competency-based training in Ghana. *Innovations in Education and Teaching International,* 49 (3), 313-323.

Boahin, P. & Hofman, W.H.A. (2011). The Concept of Competency-Based Training. In *Regulating Tertiary Education: Ghanaian and International Perspectives*. Accra - Ghana: Ghana University Press.

Boahin, P., Eggink, J. & Hofman, W.H.A. (2013). Competency-based training in international perspectives: comparing the implementation processes towards the achievement of employability. *Journal of Curriculum Studies*. (Available online: 11 December 2013), in press.

Boahin, P., & Hofman, W.H.A. (2013). A disciplinary perspective of competency-based training on the acquisition of employability skills. *Journal of Vocational Education & Training,* 65 (3), 385-401.

Boahin, P., & Hofman, W.H. A. (2013). Perceived effects of competency-based training on acquisition of professional skills. *International Journal of Educational Development*. (Available online: 13 December 2013), in press.

Boahin, P., Kamphorst, J.C. & Hofman, W.H.A. (2010). Tracer study on the performance of Polytechnic graduates in Ghanaian labour market, Accra - Ghana.

CONFERENCES & PRESENTATIONS

Boahin, P. (2006). Training course in higher education policy and management issues, October 1-20, 2006. University of Groningen, The Netherlands.

Boahin, P. (2007). Effect of CBT implementation on the teaching and learning processes in Ghanaian polytechnics, June 17, 2007. University of Groningen, The Netherlands.

Boahin, P. (2009). 35th Annual Conference of International Association for Educational Assessment 13-18 September 2009, Brisbane - Australia.

Boahin, P. (2010). 28th Annual Conference of the Association for Educational Assessment in Africa, 3-8 October 2010, Abuja - Nigeria.

Boahin, P. (2010). Exams Ethics International Conference and Awards: Ghana-Nigeria-Uganda-USA-UK, 30th November - 2nd December 2010, Accra - Ghana.

Boahin, P. (2013). Effect of Polytechnic education and training on acquisition of employability skills in Ghanaian Labour market: Implications for innovations in the teaching and learning processes. 6th Annual International Applied Research Confrence, 2-5 July 2013, Koforidua Polytechnic, Ghana.

Boahin, P. (2013). 2nd Internationl Conference of Exams Ethics Marshals: Promoting best practices in education, 12-16 August 2013, Accra - Ghana.

Boahin, P. (2013). 'TVET as an agent of change for Ghana's industrial development'. 29th Conference of the association of Principals of Technical institutions (APTI), October 13-19, 2013, Sunyani - Ghana.